3101-UM-252

# SERVICE MANUAL AND PARTS LIST

# for

# LINEARCORDER MARKVII

# model WR3101

WESTERN GRAPHTEC

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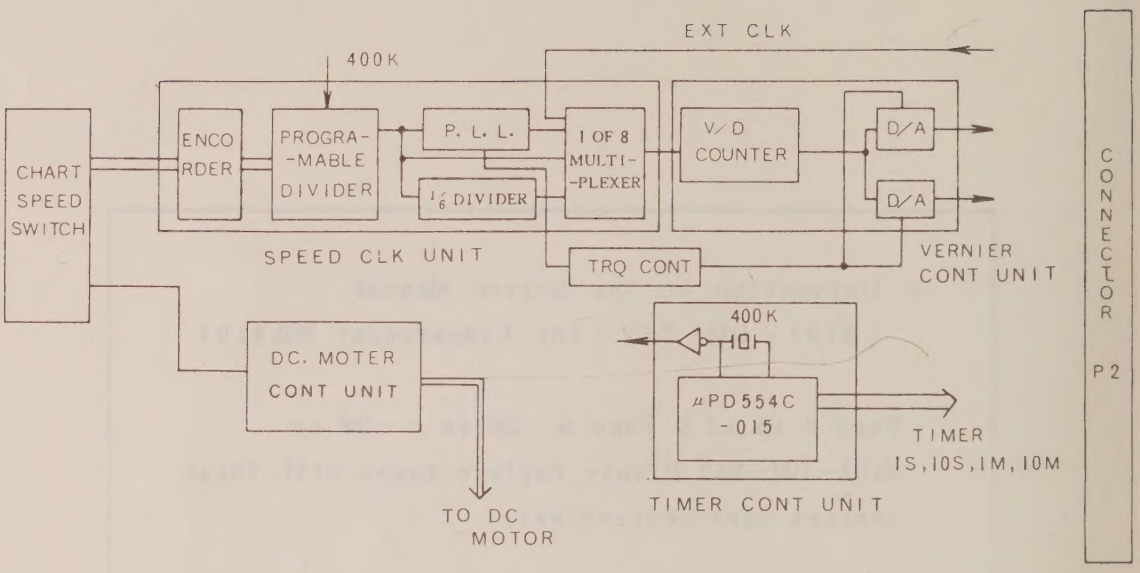
✳ Correetion on the Servce Manual
(3101－UM－252) for Linearcoder WR3101

Page 9 to 12 & Page 6－26 to 6－28 on 3101－UM－252 Please replace pages with these correct ones respectively.

## 2.6 Chart Controller




### 2.6.1 Speed CLK unit

Drives at 400 KHz and outputs CLK in accordance to the specified paper feeding speed.

1 - (1) The frequency output from the PROGRAMABLE DIVIDER is as follows (output pin (9) of IC 2):

| | |
|---|---|
| SEC button pushed | 80 N (Hz) |
| MIN button pushed | 8 N (Hz) |

(N stands for the number indicated by the button pushed.)

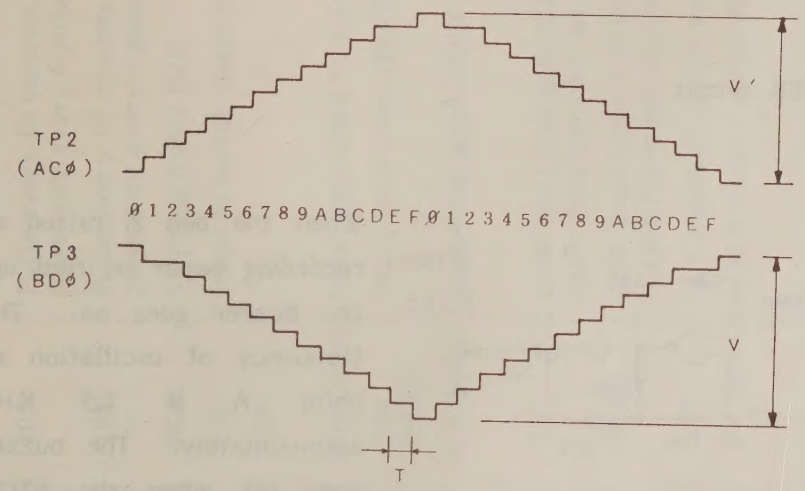
1 - (2) The frequency output from One of Eight of the MULTIPLEXER is as follows (output pin (3) of IC 11):

| | |
|---|---|
| SEC button pushed | 80 N (Hz)<br>(After acceleration is over when speed is 100 mm/sec or more.) |
| MIN button pushed | 4/3 N(Hz) |

## 2.6.2 VERNIER. CONT unit

V/D counts the CLK output from the SPEED CLK unit and outputs a voltage converted for the VERNIER drive of the stepping motor.

Note: TP2, TP3 are set based on TP1.




V' is changeable from about 0.9V by means of VRI.
When making adjustments, use VRI and see to it that V is equal to V' (V = V').

T in the above figure is as follows. (N is the number indicated by the button pressed.)

| | |
|---|---|
| SEC button pushed | T = 1/80N (SEC) |
| MIN button pushed | T = 3/4N (SEC) |

The relationship between SPEED and V is as follows:

| SPEED | V |
|---|---|
| 50 mm/sec or less | 1.4 V |
| 100 mm/sec | 1.8 V |
| 250 mm/sec | 2.1 V |
| 500 mm/sec | 2.5 V |

## 2.6.3 DC MOTOR CONT unit

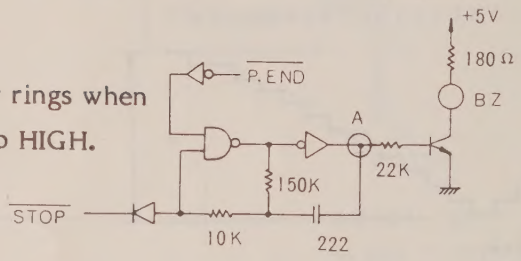
The DC motor is driven by a stabilized current.

2.6.4 TIMER CONT

A 4-bit CPU PD 554C-015 with a program to WATANABE specifications is used. Output pins (2), (3), (4) and (5) output pulses of 1 sec, 10 sec, 1 min and 10 min respectively. Resetting is done when HEAT is OFF.

2.6.5 BUZZER circuit

Buzzer rings when both go HIGH.




When the pen is raised or recording paper is used up, the buzzer goes on. The frequency of oscillation at point A is 2.5 KHz approximately. The buzzer goes off when the STOP button is pressed.

Connection with PR3101-13 CHART DRIVER

| Pin No. | Name | Description | Pin No. | Name | Description |
|---|---|---|---|---|---|
| A-1 | GND | Logic earth | B-1 | GND | Logic earth |
| A-2 | +5 V | +5 V regulator power supply | B-2 | +5 V | +5 V regulator power supply |
| A-3 | IS | Pulse every second. Double pulse once every 10 pulses. | B-3 | 10S | Pulse every 10 seconds. Double pulse once every 6 pulses. |
| A-4 | IM | Pulse every 10 minutes. Double pulse once every 10 pulses. | B-4 | 10M | Pulse every 10 minutes. Double pulse once every 6 pulses. |
| A-5 | $\overline{\text{EXT}}$ | LOW level when EXT SW is on. | B-5 | BDØ | Stepping motor D/A |
| A-6 | ACØ | Stepping motor D/A | B-6 | CØ | Pulse to switch phase of stepping motor. |
| A-7 | AØ | Pulse to switch phase of stepping motor. | B-7 | DØ | " |
| A-8 | BØ | " | B-8 | FV.PULS | Pulse equivalent to 0.2 mm shift. |
| A-9 | $\overline{\text{CHRT STP}}$ | LOW when EXT, CHRT are at STOP. | B-9 | TIM RESET | HIGH level when HEAT is OFF. |
| A-10 | CHRT CLK | EXT, CHRT CLK input. | B-10 | HEAT OFF | High level when HEAT is OFF. |
| A-11 | P.FEED | Pulse equivalent to 0.4 mm shift. | B-11 | $\overline{\text{RW}}$ | LOW level during REWIND or when paper feed switch is at STOP. |
| A-12 | | | B-12 | $\overline{\text{PEND}}$ | LOW level when PAPER END (paper is used up) or pen is raised. |
| A-13 | -8 V | -8 V regulator power supply. | B-13 | -8 V | -8 V regulator power supply. |
| A-14 | PV MOT | 20 V roughly rectified power supply. | B-14 | PV MOT | ≈ 20 V roughly rectified power supply. |
| A-15 | -8 V | -8 V regulator power supply. | B-15 | | |

LED 1 - 3 for checking

| | |
|---|---|
| LED 1 | Goes off when switching button is turned to "sheet paper". When "roll paper" is specified and the paper slackens, this comes on and the feeding speed doesn't go beyond 100 mm/sec. |
| LED 2 | Comes on once every second. Double pulse once every 10 pulses. |

## Chart Controller

| Figures | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| IC1 | G503300119 | IC, CMOS Divide-By-N Counter | TC4018BP | |
| IC2 | A503300100 | IC, CMOS Programmable Divider | 8650-0 | |
| IC3 | A503302051 | IC, NMOS Bipolar Memory | MB7056-1 | |
| IC4 | A503300118 | IC, CMOS Encorder | TC4532BP | |
| IC5 | G503300049 | IC, PMOS Micro Computer | μPD554C-015 | |
| IC6 | G503300062 | IC, CMOS Quad 2 In-Nand | TC4011BP | |
| IC7 | A503301035 | IC, CMOS MONO MULTI | HD14538B | |
| IC8 | G503300094 | IC, CMOS Hex Inverting Buffer | TC4049BP | |
| IC9 | A503302050 | IC, CMOS Quad Exclusive-OR | HD14070B | |
| IC10 | A503302049 | IC, CMOS Phase Locked Loop | HD14046B | |
| IC11 | G503300113 | IC, CMOS 8CH Multiplexer | TC4051BP | |
| IC12, 13 | G503300107 | IC, CMOS Binary U/D Counter | TC4029BP | |
| IC14 | A503302052 | IC, NMOS Bipolar Memory | MB7056-2 | |
| IC15 | G503301009 | IC, Op Amp Quad | μPC324C | |
| IC16 | G503300094 | IC, CMOS Hex Inverting Buffer | TC4049BP | |
| IC17 | G503300062 | IC, CMOS Quad 2 In-Nand | TC4011BP | |
| IC18 | G503300052 | IC, CMOS Quad Bilateral Switch | TC4066BP | |
| IC19 | G503301009 | IC, Op Amp Quad | μPC324C | |
| Q1~4 | G503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | |
| Q5 | G503203016 | T, PNP −30V −100mA 200mW | 2SA1015, Y | |
| Q6 | G503200007 | T, PNP −50V −3A 1.5W | 2SB434, O | |
| Q7 | G503200015 | T, NPN 50V 3A 1.5W | 2SD234, O | |
| CR1~11 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR12 | G503100060 | Di, Si 5.2V 0.5W ±5% | WZ052 | |
| CR13~24 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR25 | G503100006 | Di, Si 12V 0.5W ±5% | WZ120 | |
| CR26, 27 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR28 | G503100060 | Di, Si 5.2V 0.5W ±5% | WZ052 | |
| CR29 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| LED 1, 2 | A503100080 | Di, LED Red $I_F$ = 25mA | TLR102A | |
| R1 | G501810422 | R, Metal Film 22K 1/4 ±1% | RN1/4-22KF | |
| R2 | G501810412 | R, " 12K 1/4 ±1% | RN1/4-12KF | |
| R3 | G501810422 | R, " 22K 1/4 ±1% | RN1/4-22KF | |
| R4 | G501810412 | R, " 12K 1/4 ±1% | RN1/4-12KF | |
| R5 | G501810310 | R, " 1K 1/4 ±1% | RN1/4-1KF | |
| R6 | G501810315 | R, " 1.5K 1/4 ±1% | RN1/4-1.5KF | |
| R7 | G501810510 | R, " 100K 1/4 ±1% | RN1/4-100KF | |
| R8 | G501810218 | R, " 180 1/4 ±1% | RN1/4-180F | |
| R9 | G501810510 | R, " 100K 1/4 ±1% | RN1/4-100KF | |
| R10 | G501810422 | R, " 22K 1/4 ±1% | RN1/4-22KF | |
| R11 | G501810510 | R, " 100K 1/4 ±1% | RN1/4-100KF | |

| Figures | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R12 | G501810422 | R, Metal Film | 22K | 1/4 | ±1% | RN1/4-22KF | |
| R13 | G501810339 | R, " | 3.9K | 1/4 | ±1% | RN1/4-3.9KF | |
| R14 | G501810322 | R, " | 2.2K | 1/4 | ±1% | RN1/4-2.2KF | |
| R15 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R16 | G501810322 | R, " | 2.2K | 1/4 | ±1% | RN1/4-2.2KF | |
| R17 | G501810210 | R, " | 100 | 1/4 | ±1% | RN1/4-100F | |
| R18 | G501810510 | R, " | 100K | 1/4 | ±1% | RN1/4-100KF | |
| R19~22 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R23 | G501810175 | R, " | 75 | 1/4 | ±1% | RN1/4-75F | |
| R24 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R25 | G501810482 | R, " | 82K | 1/4 | ±1% | RN1/4-82KF | |
| R26 | G501810610 | R, " | 1M | 1/4 | ±1% | RN1/4-1MF | |
| R27 | G501810412 | R, " | 12K | 1/4 | ±1% | RN1/4-12KF | |
| R28 | G501810324 | R, " | 2.4K | 1/4 | ±1% | RN1/4-2.4KF | |
| R29 | G501810415 | R, " | 15K | 1/4 | ±1% | RN1/4-15KF | |
| R30 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R31, 32 | G501810415 | R, " | 15K | 1/4 | ±1% | RN1/4-15KF | |
| R33 | G501810333 | R, " | 3.3K | 1/4 | ±1% | RN1/4-3.3KF | |
| R34 | G501810391 | R, " | 9.1K | 1/4 | ±1% | RN1/4-9.1KF | |
| R35 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R36 | G501810333 | R, " | 3.3K | 1/4 | ±1% | RN1/4-3.3KF | |
| R37, 38 | G501810351 | R, " | 5.1K | 1/4 | ±1% | RN1/4-5.1KF | |
| R39 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R40 | G501810368 | R, " | 6.8K | 1/4 | ±1% | RN1/4-6.8KF | |
| R41 | G501810422 | R, " | 22K | 1/4 | ±1% | RN1/4-22KF | |
| R42 | G501810347 | R, " | 4.7K | 1/4 | ±1% | RN1/4-4.7KF | |
| R43 | G501810422 | R, " | 22K | 1/4 | ±1% | RN1/4-22KF | |
| R44 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R45 | G501810510 | R, " | 100K | 1/4 | ±1% | RN1/4-100KF | |
| R46 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R47 | G501810310 | R, " | 1K | 1/4 | ±1% | RN1/4-1KF | |
| R48 | G501810215 | R, " | 150 | 1/4 | ±1% | RN1/4-150F | |
| R49 | G501810510 | R, " | 100K | 1/4 | ±1% | RN1/4-100KF | |
| R50 | G501810436 | R, " | 36K | 1/4 | ±1% | RN1/4-36KF | |
| R51 | G501810447 | R, " | 47K | 1/4 | ±1% | RN1/4-47KF | |
| R52 | G501810533 | R, " | 330K | 1/4 | ±1% | RN1/4-330KF | |
| R53 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R54 | G501810533 | R, " | 330K | 1/4 | ±1% | RN1/4-330KF | |
| R55 | G501810310 | R, " | 1K | 1/4 | ±1% | RN1/4-1KF | |
| R56 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R57 | G501810322 | R, " | 2.2K | 1/4 | ±1% | RN1/4-2.2KF | |
| R58 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R59 | G501810520 | R, " | 200K | 1/4 | ±1% | RN1/4-200KF | |
| R60 | G501810456 | R, " | 56K | 1/4 | ±1% | RN1/4-56KF | |
| R61 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |

| Figures | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R62 | G501810422 | R, Metal Film | 22K | 1/4 | ±1% | RN1/4-22KF | |
| R63 | G501810410 | R, " | 10K | 1/4 | ±1% | RN1/4-10KF | |
| R64 | G501810456 | R, " | 56K | 1/4 | ±1% | RN1/4-56KF | |
| R65 | G501810310 | R, " | 1K | 1/4 | ±1% | RN1/4-1KF | |
| R66, 67 | A501604703 | R, " | 220 | 1/2 | ±5% | RSF1/2B-220J | |
| R68 | G501810322 | R, " | 2.2K | 1/4 | ±1% | RN1/4-2.2KF | |
| R69 | G501810310 | R, " | 1K | 1/4 | ±1% | RN1/4-1KF | |
| R70 | A501609728 | R, Wirewound | 10, | 5, | ±5% | CS5P-10J | For 2, 4CH |
| | A50160729 | R, Wirewound | 8.2, | 5, | ±5% | CS5P-8.2J | For 6CH |
| | A50160730 | R, " | 6.8, | 5, | ±5% | CS5P-6.8J | For 8CH |
| | A50160731 | R, " | 5.6, | 5, | ±5% | CS5P-5.6J | For 12CH |
| R71 | G501810227 | R, Metal Film | 270 | 1/4 | ±1% | RN1/4-270F | |
| RA1 | A501003334 | Resister Arrey | | | | EXB-P8-8-103J | |
| RA2 | A501003332 | Resister Arrey | | | | EXB-P8-8-222J | |
| RA3, 4 | A501003333 | Resister Arrey | | | | EXB-P8-8-124J | |
| VR1 | G505103026 | R, Trimmer Cermet | 5K | | | GF6P-5K | |
| C1~6 | G502403007 | C, Ceramic | 0.01μ | 50WV | | ULD06-103-L2A | |
| C7 | G502203013 | C, Tantalum | 1μ | 35WV | | CS15E1V010M | |
| C8 | A502102064 | C, Electrolytic | 47μ | 10WV | | ECEA1AS470 | |
| C9 | G502203003 | C, Tantalum | 3.3μ | 16WV | | CS15E1C3R3M | |
| C10 | A502403028 | C, Ceramic | 2200P | 50WV | | UFD04SA222J-L2A | |
| C11, 12 | G502303002 | C, Myler Film | 0.001μ | 50WV | | MFL-05D1 | |
| C13, 14 | A502703021 | C, Mica | 33P | 100WV | | Z05-100V33P | |
| C15 | A502102064 | C, Electrolytic | 47μ | 10WV | | ECEA1AS470 | |
| C16, 17 | A502102029 | C, " | 47μ | 16WV | | ECEA1CS470 | |
| C18 | G502403007 | C, Ceramic | 0.01μ | 50WV | | ULD06-103-L2A | |
| C19 | A502303019 | C, Myler Film | 0.0015μ | 50WV | | MFL-05D15 | |
| C20, 21 | G502403007 | C, Ceramic | 0.01μ | 50WV | | ULD06-103-L2A | |
| C22, 23 | G502203002 | C, Tantalum | 10μ | 16WV | | CS15E1C100M | |
| C24 | G502303001 | C, Myler Film | 0.0022 | 50WV | | MFL-05D22 | |
| C25 | A502303019 | C, " | 0.0015μ | 50WV | | MFL-05D15 | |
| C26 | G502303004 | C, " | 0.01μ | 50WV | | MFL-05S1 | |
| C27 | G502303005 | C, " | 0.047μ | 50WV | | MFL-05S47 | |
| TP1~3 | B513400027 | Check Pin | | | | LC-1-G | |
| BZ | A519300001 | Buzzer | | | | SD161201 | |
| X1 | A519105001 | X Crystal Oscillator | | 400KHz | | HC-6/UW-400KHz | |
| S1 | A508201013 | Switch Push Non-Lock | | | | KSD1-2-ONLDC | |
| S2, 3 | A508213001 | Switch Push Lock | | | | KSD2-4-10LLDC | |
| S4~10 | A508207001 | Switch Push Lock | | | | KSD7-14-10ILDC | |
| S11 | A508201013 | Switch Push Non-Lock | | | | KSD1-2-ONLDC | |

| Figures | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| P1 | G513400045 | Connector Pin Header 5P | HNC2-2.5P5DSL | |
| P2 | A513301010 | " 30P | PS30PED4T1PN1 | |
| FCA | A520110060 | Flat Cable With Connector 30 PIN 42mm | L42-30P | |
| P1001 | G513200101 | Connector Plug 1P | 1625-1P-1 | |
| PIN | G513400001 | Connector Pin | 1854TL | |
| P.C.B. | A511310310 | Printed Circuit Board | 3101-40 | |
| | B516100020 | Cap Black | B911 | x 10 |
| | A516100025 | Cap Ivory | B201 | |
| | B508201007 | Spacer | IP-10 | x 11 |

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# 5. Parts list

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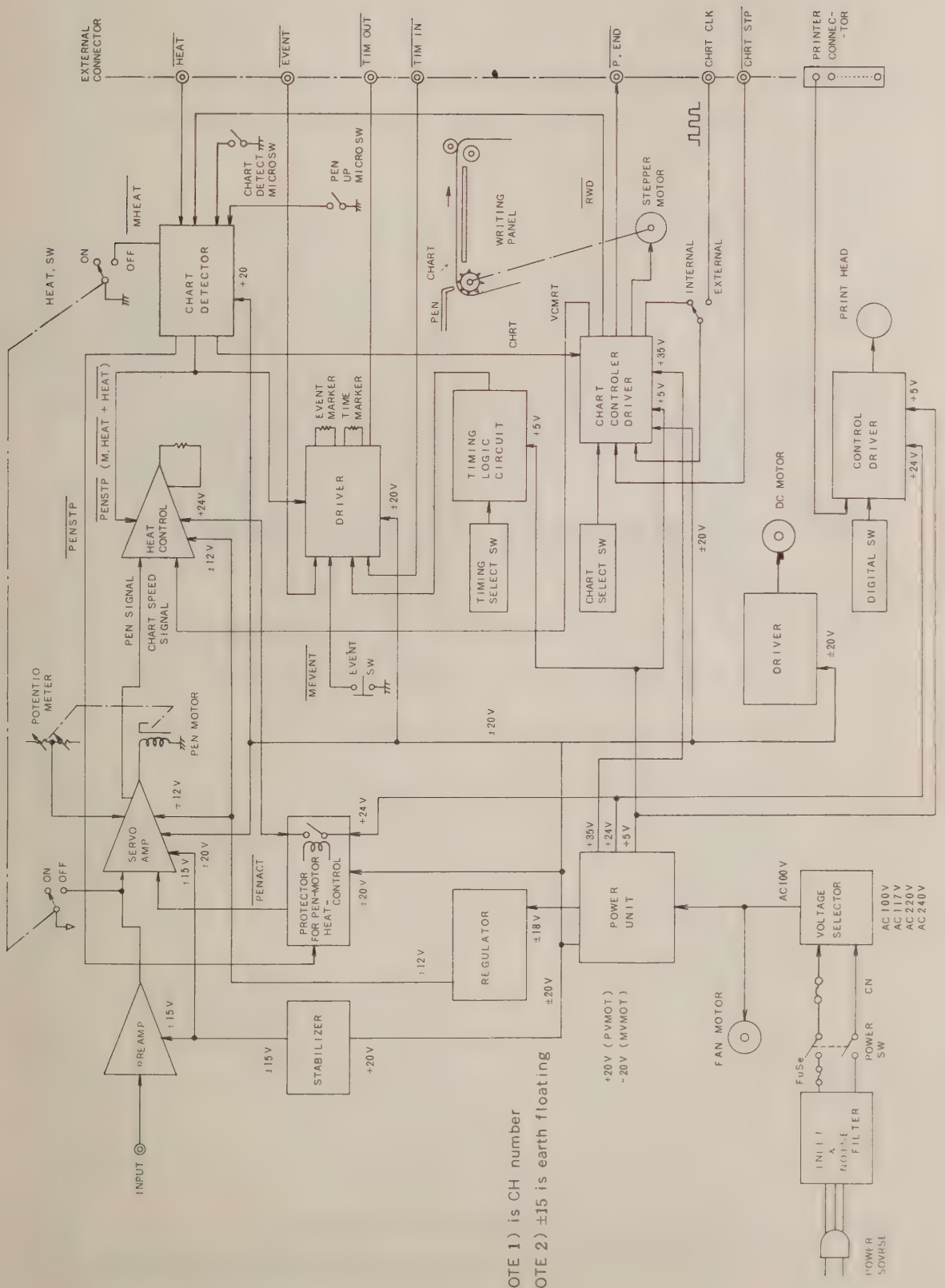
# 1. Block diagram



## 2. Outline of the operation of each block

### 2.1 Power unit

(1) Input: 100 V, 117 V, 220 V, 240 V AC
(selected through the voltage selector on the base plate of the recoder)

(2) Output:

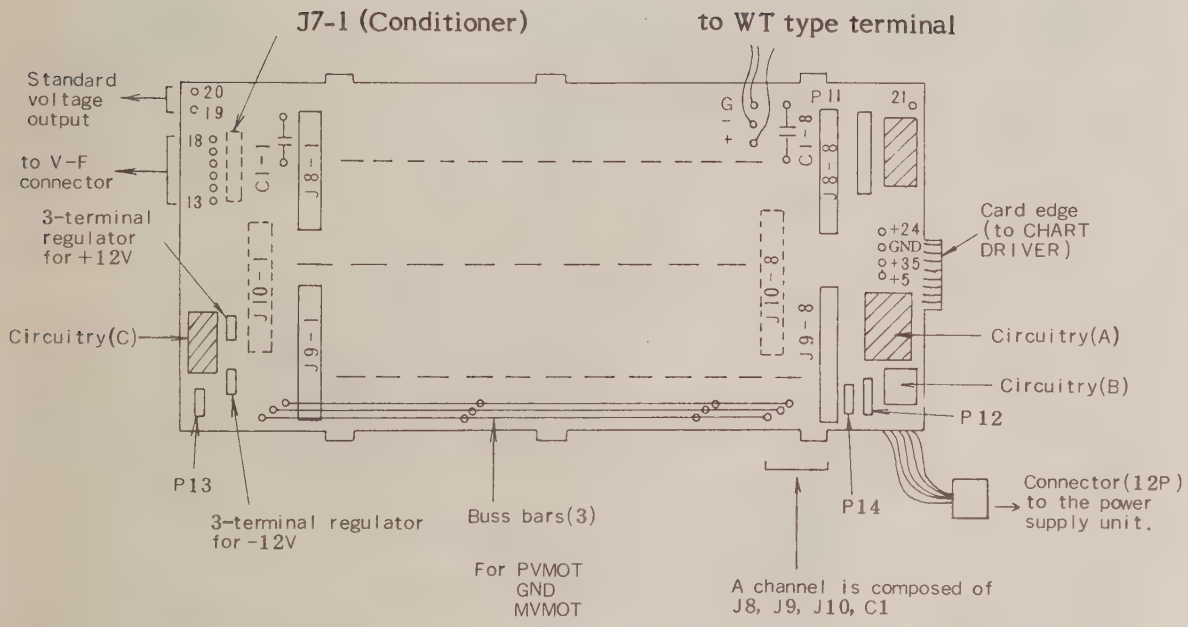
| Circuit signal | Meaning | For AC 100 V input | | | |
|---|---|---|---|---|---|
| | | Output specification | Unloaded voltage | Ripple | Voltage regulation range (load status) |
| PV MOT | Power supply for pen motor (+), +20 V | +16 V,10 A (+20 V) | 22.5 V | Half-wave capacity 10 A load | +16.6 - +22.5 |
| MV MOT | Power supply for pen motor (-), -20 V | -16 V, 10 A (-20 V) | -22.5 V | 3 V p-p | - 16.6 - -22.5 |
| +35 | Power supply for stepping motor | +35 V, 2.5 A | 42.5 V | 2.5 V p-p at 2.5 A load | +33 - +39 |
| +24 | For heat pen and printer head | +24 V, 5 A | 23.7 V | | ±1% |
| +18 | For +12 V, 3-terminal regulator | +18 V, 0.5 A | 26 V | 2.7 V p-p at 400 mA load | +20.5 - +23.3 |
| +5 | For paper feed control, logic | +5 V, 1 A | 5 V | | 2% |
| -18 | Input for -12 V, 3-terminal regulator | -18 V, 0.5 A | -26 V | 2.7 V p-p at 400 mA load | -20.8 - -23 |
| GND | GND for PV MOT, MV MOT, +35, +24 | | | | |
| SGND | GND for +18, -18, +5 | | | | |

Note: +5 V and +24 V are stabilized by series regulator.
100 V AC for fan drive (fan is not available in the 2 ch, 4 ch versions)

## 2.2 Mother board

### 2.2.1 Construction

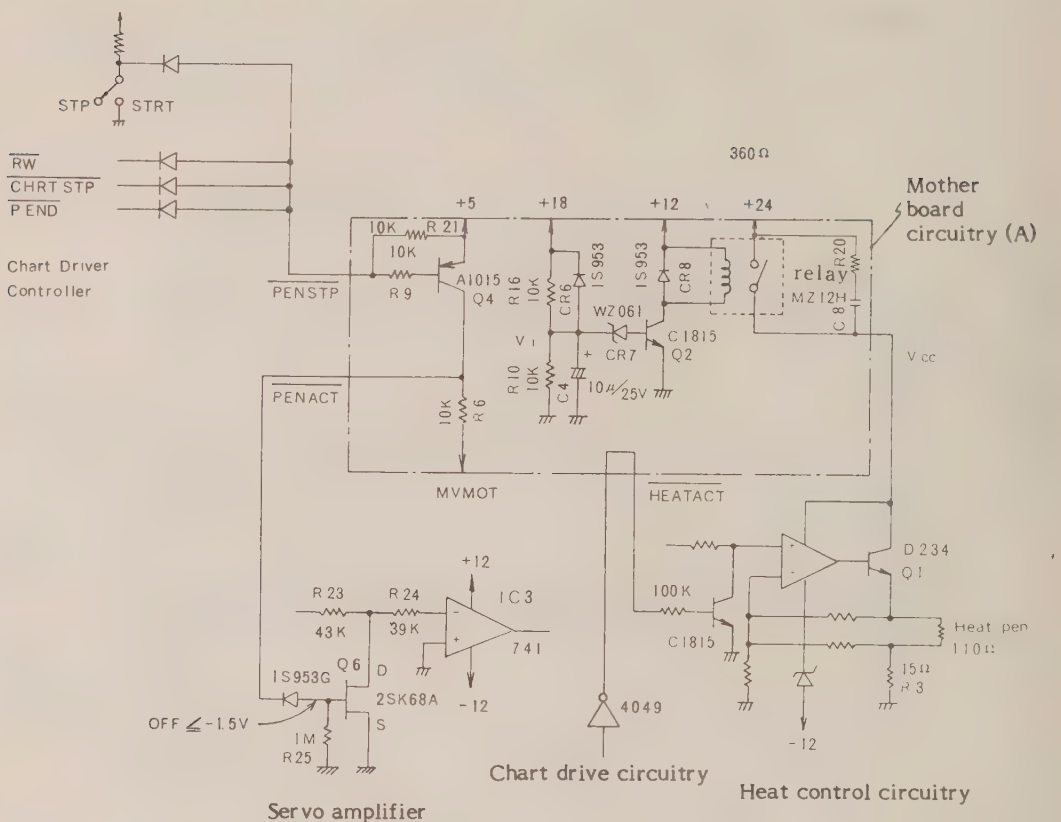
#### 1) Basic construction




Arrangement of parts on 8 CH mother board

## 2.2.2 Explanation of operation

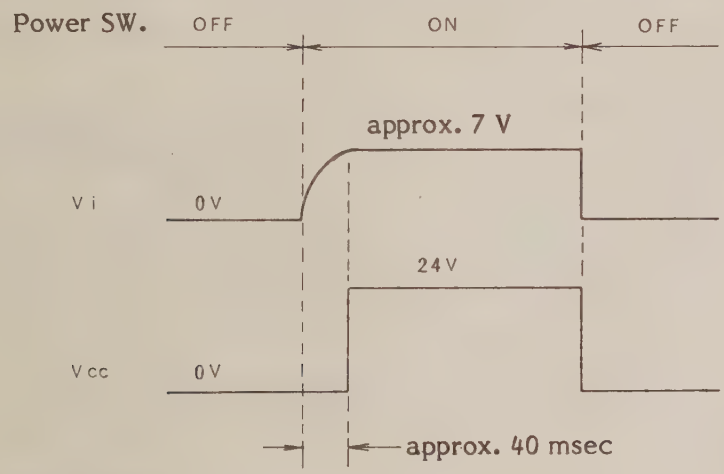
### 1) Circuitry (A)




(a) This circuitry, in its normal state, receives the signal from the chart drive circuitry (PEN STP) and inputs a "0" to the pen motor drive circuitry (IC3) when: (1) paper feed switch is turned to STOP, (2) paper is rewinding, (3) paper is used up, or (4) pen is up.

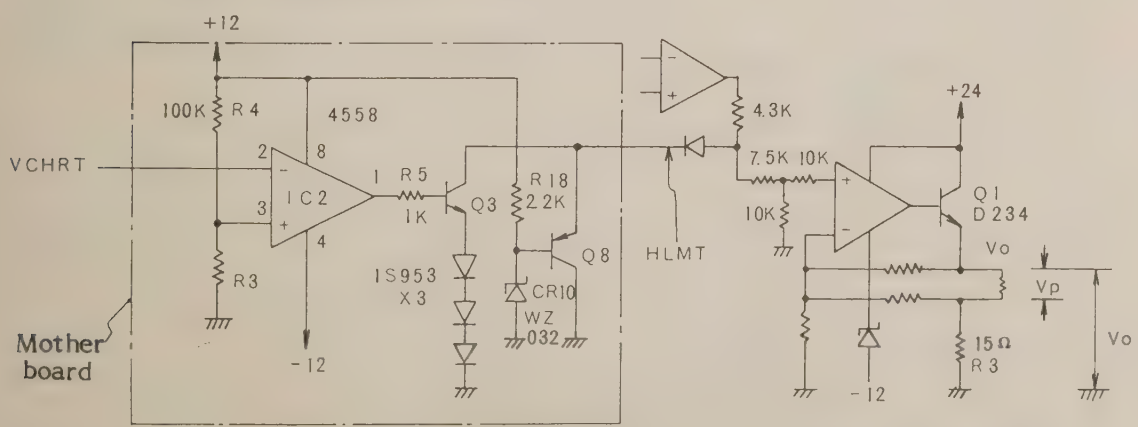
(b) This circuitry prevents excessive voltage being applied to the heat pen when power is being turned on/off. The timing chart is as shown below.

| Signal name | | |
|---|---|---|
| $\overline{\text{PEN STP}}$ | Input | o Pen motor operates when at HIGH level.<br>o No torque applied to pen motor when at LOW level. |
| $\overline{\text{PEN ACT}}$ | Output | o Pen motor operates when over -1.5 V.<br>o No torque applied to pen motor when below -1.5 V. |
| $\overline{\text{HEAT ACT}}$ | Output | o Heat pen usable when below 0.6 V.<br>o Heat pen can't be used when over 0.6 V. |




2) Circuitry (B)

When the paper feeding speed is below 19 mm/sec. and the pen is being moved at a high frequency, this circuitry prevents a voltage exceeding 8 V being applied to the pen heater.

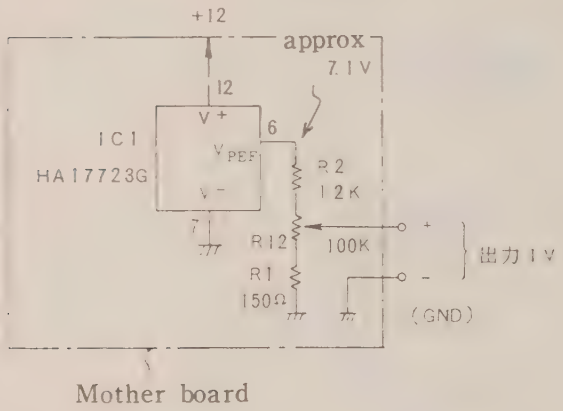



Heat control circuitry

VCHRT is the signal to specify paper feeding speed by a voltage which is proportional to the paper feeding speed. (250 mV = 100 mm/s)

| Paper feed speed | IC 2 output | Q3 | HLMT | Voltage of heat pen + side (GND) |
|---|---|---|---|---|
| Below 19 mm/sec. | +10 - +12 V | ON | +2.3 V (approx.) | $V_o \fallingdotseq 8$ V ($V_p \fallingdotseq 7$ V) |
| Above 19 mm/sec. | -10 - -12 V | OFF | +3.9 V (approx.) | $V_0 \fallingdotseq 13$ V ($V_p \fallingdotseq 11$ V) |

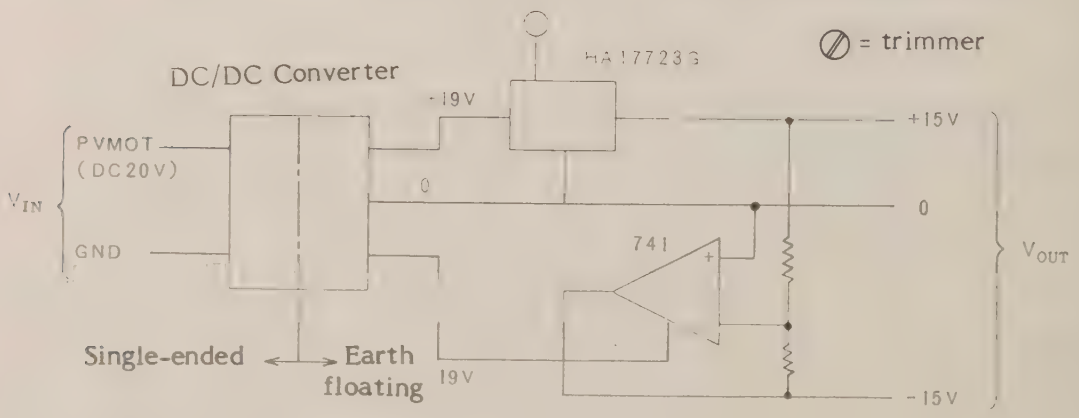
3) Circuitry (C)




Generates a standard voltage of +1 V. Output resistance is about 200 Ω.

## 2.3 Stabilizer

### 2.3.1 Block diagram

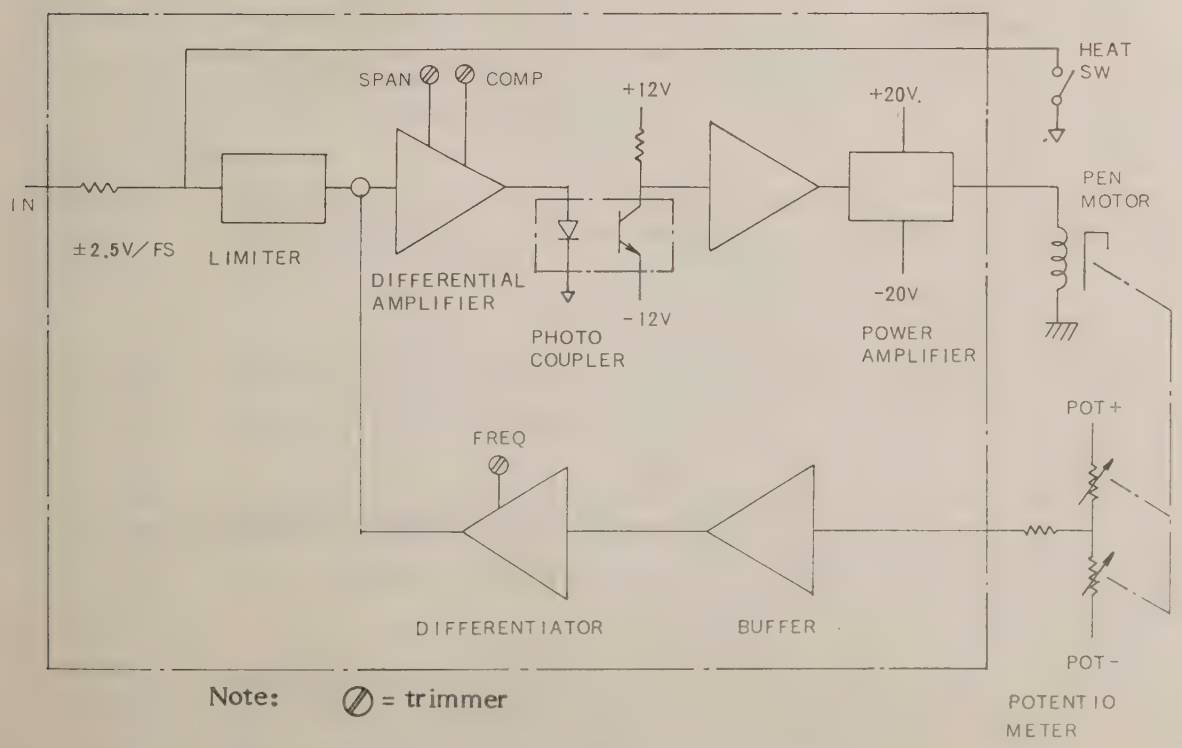


2.3.2 Contents

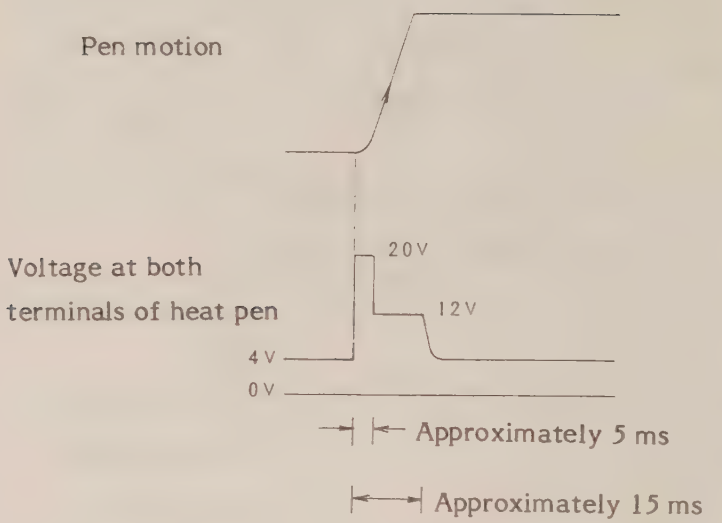
| Item | | Specification | Remarks |
|---|---|---|---|
| Input voltage | V IN | 11 - 24 V DC (Single line earthing) | |
| Input power | P IN | ±45 mA loaded: 2.8 W TYP<br>±5 mA loaded: 0.8 W TYP | |
| Output voltage | V OUT | ±15 V ±20% | Possible to set to ±0.1% |
| Max. output current | MAX I OUT | ±45 mA | +34 mA, -29mA TYP when pre-amplifier, servo amplifier and heater circuitry operating. |
| Remaining ripple | | About 7 mV p-p (100 KHz) | Standard load |

2.4 Servo Amplifier (including pen motor, potentiometer)

2.4.1 Block diagram



## 2.5 Heat control circuitry




When short wave-forms are being input continuously, the comparator cuts the acceleration signal in order to lower the pulse.

Values typical of pen position signal and paper feeding speed signal are as follows:

Pen position signal

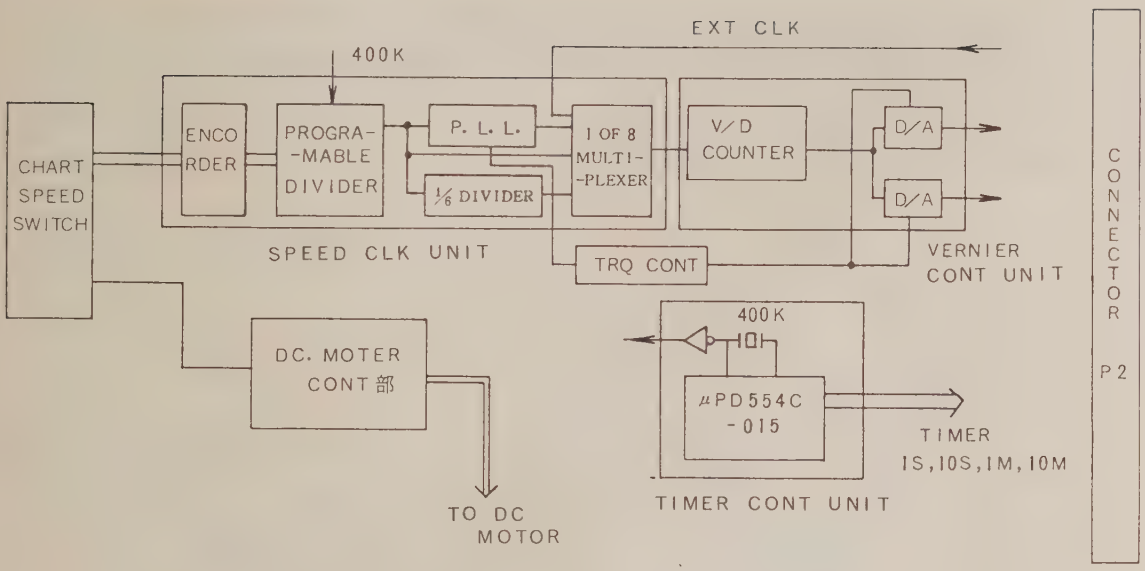
| Pen amplitude | Voltage POTC |
|---|---|
| S type 40 mm p-p<br>W type 80 mm p-p | (700 ±230) mV p-p |

Feeding speed signal

| Feeding speed | Voltage VCHRT |
|---|---|
| 10 mm/s | 25 mV |
| 50 mm/s | 125 mV |
| 100 mm/s | 250 mV |
| 500 mm/s | 1.25 V |

Feeding speed and voltage are proportional to each other in the other cases too.

## 2.6 Chart Controller




### 2.6.1 Speed CLK unit

Drives at 400 KHz and outputs CLK in accordance to the specified paper feeding speed.

1 - (1) The frequency output from the PROGRAMABLE DIVIDER is as follows (output pin (9) of IC 7):

| | |
|---|---|
| SEC button pushed | 40 N (Hz) |
| MIN button pushed | 4 N (Hz) |

(N stands for the number indicated by the button pushed.)

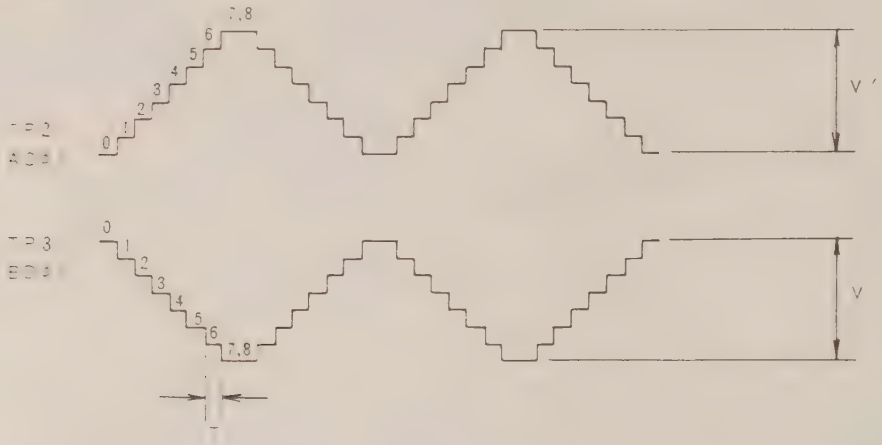
1 - (2) The frequency output from 1 of 8 of the MULTIPLEXER is as follows (output pin (3) of IC 14):

| | |
|---|---|
| SEC button pushed | 40 N (Hz)<br>(After acceleration is over when speed is 100 mm/sec or more.) |
| MIN button pushed | 2/3 N(Hz) |

2.6.2 VERNIER. CONT unit

V/D counts the CLK output from the SPEED CLK unit and outputs a voltage converted for the VERNIER drive of the stepping motor.

Note: TP2, TP3 are set based on TP1.




V' is changeable from 0V by means of VRI. When making adjustments, use VRI and see to it that V is equal to V' (V = V').

T in the above figure is as follows. (N is the number indicated by the button pressed.)

| | |
|---|---|
| SEC button pushed | T = 1/40N (SEC) |
| MIN button pushed | T = 3/2N (SEC) |

The relationship between SPEED and V is as follows:

| SPEED | V |
|---|---|
| 50 mm/sec or less | 1.3 V |
| 100 mm/sec | 1.6 V |
| 250 mm/sec | 1.8 V |
| 500 mm/sec | 2.1 V |

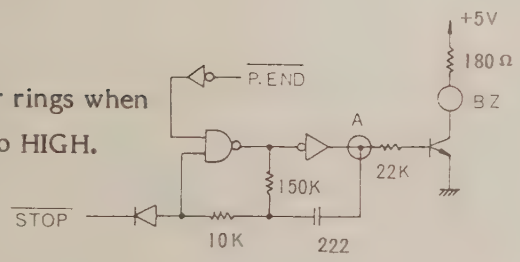
2.6.3 DC MOTOR CONT unit

The DC motor is driven by a stabilized current.

### 2.6.4 TIMER CONT

A 4-bit CPU PD 554C-015 with a program to WATANABE specifications is used. Output pins (2), (3), (4) and (5) output pulses of 1 sec, 10 sec, 1 min and 10 min respectively. Resetting is done when HEAT is OFF.

### 2.6.5 BUZZER circuit




Buzzer rings when both go HIGH.

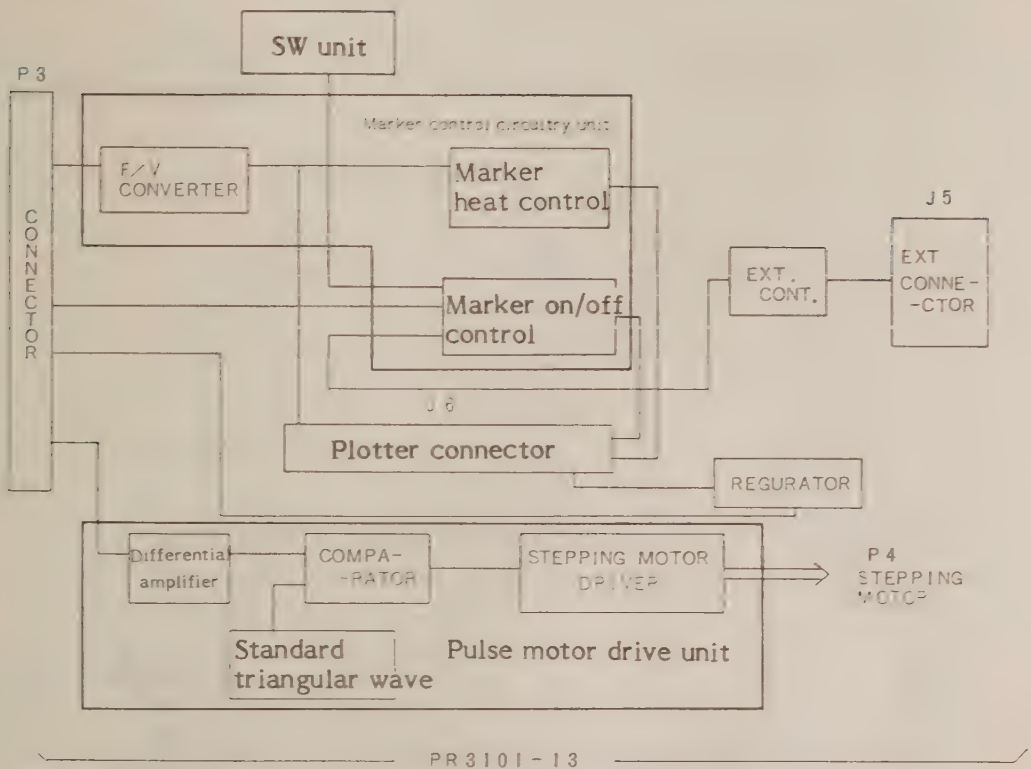
When the pen is raised or recording paper is used up, the buzzer goes on. The frequency of oscillation at point A is 2.5 KHz approximately. The buzzer goes off when the STOP button is pressed.

| Pin No. | Name | Description | Pin No. | Name | Description |
|---|---|---|---|---|---|
| A-1 | GND | Logic earth | B-1 | GND | Logic earth |
| A-2 | +5 V | +5 V regulator power supply | B-2 | +5 V | +5 V regulator power supply |
| A-3 | IS | Pulse every second. Double pulse once every 10 pulses. | B-3 | 10S | Pulse every 10 seconds. Double pulse once every 6 pulses. |
| A-4 | IM | Pulse every 10 minutes. Double pulse once every 10 pulses. | B-4 | 10M | Pulse every 10 minutes. Double pulse once every 6 pulses. |
| A-5 | $\overline{\text{EXT}}$ | LOW level when EXT SW is on. | B-5 | BDØ | Stepping motor D/A |
| A-6 | ACØ | Stepping motor D/A | B-6 | CØ | Pulse to switch phase of stepping motor. |
| A-7 | AØ | Pulse to switch phase of stepping motor. | B-7 | DØ | " |
| A-8 | BØ | " | B-8 | FV.PULS | Pulse equivalent to 0.2 mm shift. |
| A-9 | $\overline{\text{CHRT STP}}$ | LOW when EXT, CHRT are at STOP. | B-9 | TIM RESET | HIGH level when HEAT is OFF. |
| A-10 | CHRT CLK | EXT, CHRT CLK input. | B-10 | HEAT OFF | High level when HEAT is OFF. |
| A-11 | P.FEED | Pulse equivalent to 0.4 mm shift. | B-11 | $\overline{\text{RW}}$ | LOW level during REWIND or when paper feed switch is at STOP. |
| A-12 | | | B-12 | $\overline{\text{PEND}}$ | LOW level when PAPER END (paper is used up) or pen is raised. |
| A-13 | -8 V | -8 V regulator power supply. | B-13 | -8 V | -8 V regulator power supply. |
| A-14 | PV MOT | 20 V roughly rectified power supply. | B-14 | PV MOT | ≈ 20 V roughly rectified power supply. |
| A-15 | -8 V | -8 V regulator power supply. | B-15 | MV MOT | ≈ -20 V roughly recified power supply. |

LED 1 - 3 for checking

| | |
|---|---|
| LED 1 | Pulse switching the phase of the pulse motor. Comes on. Used for checking the action of the pulse motor. |
| LED 2 | Goes off when switching button is turned to "sheet paper". When "roll paper" is specified and the paper slackens, this comes on and the feeding speed doesn't go beyond 100 mm/sec. |
| LED 3 | Comes on once every second. Double pulse once every 10 pulses. |

## 2.7 Chart driver




### 2.7.1 Marker control circuit

Timer is MONO, MULTI. The double pulses are erased by TC 4528. The pulse width can be varied by the timer setting as shown below in Fig. 2.

Note: Since TC 4528 can be retriggered, when a double pulse is output, it is lengthened by 280 ms approximately in the 10 sec, 1 min and 10 min cases.

Table I Marker COM terminal voltage (TP3) vs. SPEED

| Chart speed | Marker COM voltage |
|---|---|
| 10 mm/sec | ≈ 8.0 V |
| 100 mm/sec | ≈ 10.0 V |
| 250 mm/sec | ≈ 14.5 V |
| 500 mm/sec | ≈ 17.0 V |

Table II Timer select vs. ACTIVE TIME

| Timer select | Active time |
|---|---|
| 1 sec | ≈ 250 ms |
| 10 sec | ≈ 800 ms |
| 1 min | ≈ 4.2 s |
| 10 min | ≈ 8.2 s |

2.7.2 EXT. IN OUT control unit

EXT. connector

| Pin No. | Name | IN.OUT.LEVEL | Description |
|---|---|---|---|
| 1 | $\overline{\text{P.END}}$ | OUT LOW ACTIVE | LOW output when paper is used up or pen is raised. |
| 2 | $\overline{\text{EVENT}}$ | IN LOW ACTIVE | EVENT switch and OR |
| 3 | $\overline{\text{TIM OUT}}$ | OUT LOW ACTIVE | Synchronism output of timer (master) |
| 4 | $\overline{\text{TIM IN}}$ | IN NEGATIVE EDGE | Timer input possible from TIMING SW EXT (slave facility). |
| 5 | $\overline{\text{HEAT}}$ | IN LOW ACTIVE | HEAT SW and OR. |
| 6 | CHRT STP | IN HIGH ACTIVE | ON when current is flowing. Priority given to STOP switch. |
| 7 | CHRT CKL | IN PULSE | Enabled when EXT. SW is on. 0.025 mm/1 pulse. Only up to 2 KHz. |
| 8 | GND | | Logic, earth |
| 9 | GND | | " |
| 10 | GND | | " |
| 11 | GND | | " |
| 12 | GND | | " |
| 13 | NC | | " |
| 14 | +5 V | | Output resistance 10 KΩ. |

### 2.7.3 Stepping motor driver unit

1Ω (3W) resistor for current detection is used to make a fixed current closed circuit.

(1) Differential amplifier

Amplifies the difference between the analog-converted-voltage in the chart controller and the voltage at both ends of the resistor to detect the stepping motor's current.

(2) Standard triangular wave

Stabilizes the switching frequency of the current passed into the motor coil.

(3) Comparator

Compares the differential amplifier's output and the standard triangular wave and fixes the "switch on" time of the current motor coil.

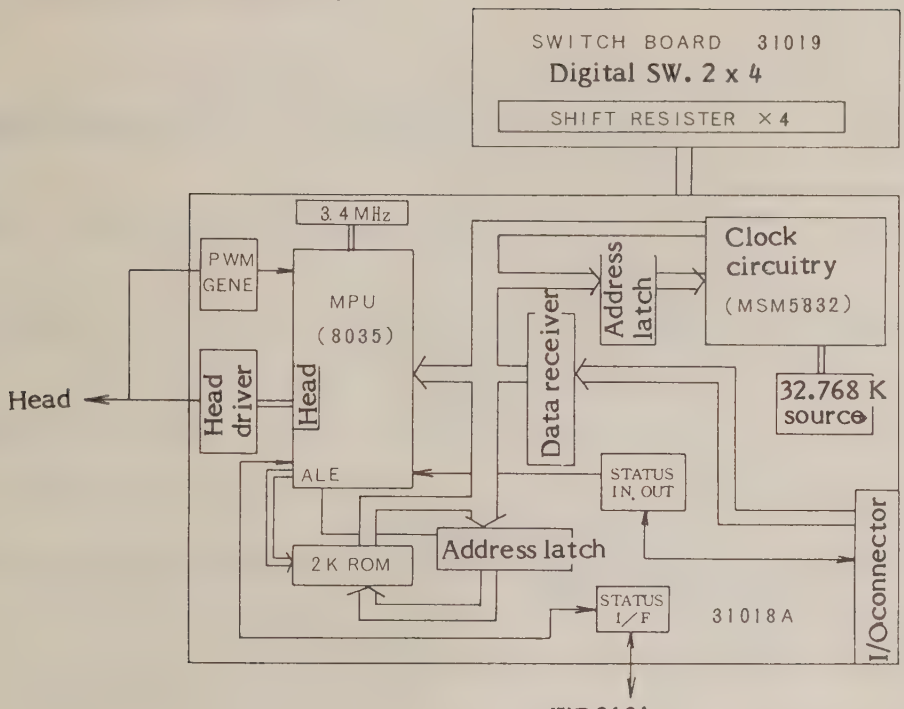
(4) Driver

Passes current into the motor coil.

2.7.4 Connection to the LINEARCORDER

| Pin No. | Name | IN/OUT | Description |
|---|---|---|---|
| A1 | GND | | |
| B1 | GND | | |
| A2 | PV MOT | | ≈+20 V roughly rectified power supply. |
| B2 | MV MOT | | ≈-20 V " |
| A3 | +5 V | | +5 V regulated power supply. |
| B3 | PLV | | ≈+35 V roughly rectified power supply. |
| A4 | VP 1 | IN PULSE | Functions the same as OPTION, V/F unit, external (HR) CLK. |
| B4 | EXT | OUT LEVEL | LOW output when EXT switch is off. |
| A5 | EVENT 1 | | EVENT ON switch. |
| B5 | EVENT 2 | | EVENT OFF switch. |
| A6 | TIM 1 | | TIMING ON switch. |
| B6 | MRK C | OUT LEVEL | Marker applied voltage. |
| A7 | TIM 2 | | TIMING OFF switch. |
| B7 | PRT ON | OUT LEVEL | Print on when HIGH. |
| A8 | P FEED | OUT PULSE | Control of printed dot spacing. 0.4 mm/pulse |
| B8 | 1 SEC | OUT PULSE | Pulse once a second. |
| A9 | $\overline{\text{HEAT}}$ | OUT LEVEL | HEAT ON when LOW. |
| B9 | V CHRT | OUT LEVEL | Voltage proportional to chart speed. STOP; Ø V → 500 mm/sec; 1.25 V approx. |
| A10 | MICRO | OUT LEVEL | LOW when pen is raised or paper is used up. |
| B10 | $\overline{\text{PEN STP}}$ | OUT LEVEL | Pen motor input is ON when output is LOW. |

## 2.8 Printer control circuitry




Power source: Logic +5 V
Head +24 V

### (1) SWITCH BOARD

| | |
|---|---|
| KP | Key preset; stores the contents of SWITCH in the shift register. |
| SP | Shift pulse; shifts the contents of the shift register one by one to SD's terminal and outputs them. |
| SD | Serial data. |

### (2) Clock circuitry

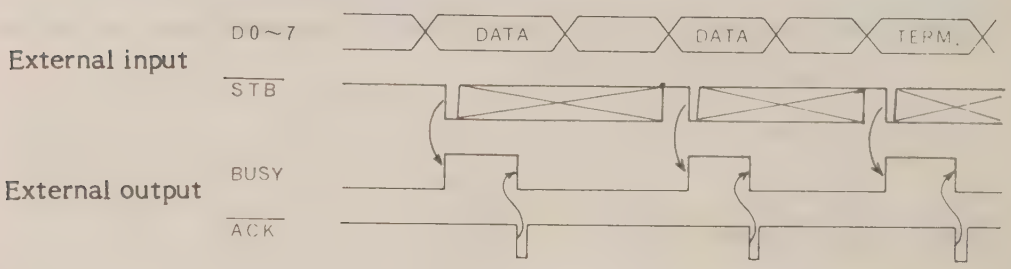
Works from 32.768 KHz source. Outputs year, month, day, hour.

(3) Connection to the printer

| | |
|---|---|
| P FEED | Pulse to fix the dot spacing; 0.4 mm shift on recording paper every pulse (0.4 mm/pulse). |
| 1 SEC | Pulse/sec. For convertion of pulse number when paper feeding speed is externally controlled. |
| PRT ON | Turns on/off the voltage applied to the printer. ON when HIGH, and in digital switch read mode only when LOW. |
| EXT | HIGH level when in EXT mode. LOW level when not in EXT mode. |
| +24 V | Power supply for print head drive. |
| +5 V | Logic power supply. |
| GND | 0 V |

(4) External interface

Input signals: $\overline{STB}$, DØ - 7.
Output signals: BUSY, $\overline{BUSY}$, $\overline{ACK}$.
Based on Centronix system. Input sequences are as follows.



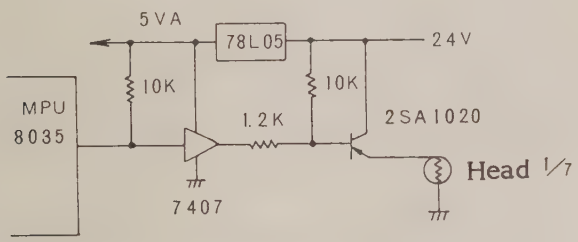

Note: $\overline{ACK}$: pulse width is typically 2/1s. Data should be maintained until $\overline{ACK}$ output is finished. Terminator is LF or CR.

(5) MPU 8035

Upon receipt of signals (1) - (4) above, MPU 8035 proceeds according to the data stored in the 2 Kbyte ROM.

(6) Print head protection circuit

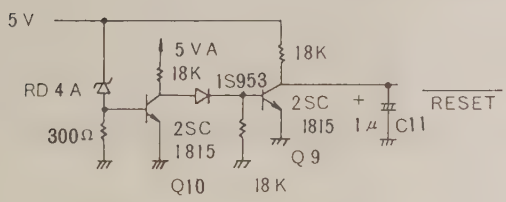
+5 V is regulated by the 24 V power supply for the protection of the input sequence of the head drive and logic power supply.




Print head protection circuit

(7) MPU RESET circuitry

Until the logic power supply (5 V) exceeds 4.6 V, transistor Q8 is cut off and Q9 is on. The MPU is reset.




Precautions to take when using an external CPU:

(1) Confirm the sequence of external interface (based on Centronix) in (4) above.

(2) Confirm that a terminator CR or LF follows the output character string.

(3) Confirm that there is no transmission of data not included in the chart of permissable ASCII codes.

(4) The correct printing of data not included in the chart is not guaranteed.

## Table 68-digit code for Alphanumeric and Katakana characters

| Rank / Line | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NUL | $TC_7$(DLE) | (SP)(3) | 0 | @ | P | 、 | p | ↑ | ↑ | Unde cided | — | タ | ミ | ↑ | ↑ |
| 1 | $TC_1$(SOH) | $DC_1$ | ! | 1 | A | Q | a | q | ⋮ | ⋮ | 。 | ア | チ | ム | ⋮ | ⋮ |
| 2 | $TC_2$(STX) | $DC_2$ | 〃 | 2 | B | R | b | r | ⋮ | ⋮ | 「 | イ | ツ | メ | ⋮ | ⋮ |
| 3 | $TC_3$(ETX) | $DC_3$ | # | 3 | C | S | c | s | ⋮ | ⋮ | 」 | ウ | テ | モ | ⋮ | ⋮ |
| 4 | $TC_4$(EOT) | $DC_4$ | $ | 4 | D | T | d | t | ⋮ | ⋮ | 、 | エ | ト | ヤ | ⋮ | ⋮ |
| 5 | $TC_5$(ENQ) | $TC_8$(NAK) | % | 5 | E | U | e | u | Nor yet decided | Nor yet decided | ・ | オ | ナ | ユ | Undecided | Undecided |
| 6 | $TC_6$(ACK) | $TC_9$(SYN) | & | 6 | F | V | f | v | ⋮ | ⋮ | ヲ | カ | ニ | ヨ | ⋮ | ⋮ |
| 7 | BEL | $TC_{10}$(ETB) | • | 7 | G | W | g | w | ⋮ | ⋮ | ァ | キ | ヌ | ラ | ⋮ | ⋮ |
| 8 | $FE_0$(BS) | CAN | ( | 8 | H | X | h | x | ⋮ | ⋮ | ィ | ク | ネ | リ | ⋮ | ⋮ |
| 9 | $FE_1$(HT) | EM | ) | 9 | I | Y | i | y | ⋮ | ⋮ | ゥ | ケ | ノ | ル | ⋮ | ⋮ |
| 10 | $FE_2$(LF) | SUB | * | : | J | Z | j | z | ⋮ | ⋮ | ェ | コ | ハ | レ | ⋮ | ⋮ |
| 11 | $FE_3$(VT) | ESC | + | ; | K | [ | k | { | ⋮ | ⋮ | ォ | サ | ヒ | ロ | ⋮ | ⋮ |
| 12 | $FE_4$(FF) | $IS_4$(FS) | , | < | L | ¥ | l | \| | ⋮ | ⋮ | ャ | シ | フ | ワ | ⋮ | ⋮ |
| 13 | $FE_5$(CR) | $IS_3$(GS) | − | = | M | ] | m | } | ⋮ | ⋮ | ュ | ス | ヘ | ン | ⋮ | ⋮ |
| 14 | SO | $IS_2$(RS) | . | > | N | ↑ | n | — | ⋮ | ⋮ | ョ | セ | ホ | ゛ | ⋮ | ⋮ |
| 15 | SI | $IS_1$(US) | / | ? | O | ← | o | DEL | ↓ | ↓ | ッ | ソ | マ | ° | ↓ | ↓ |

Note: The characters within bold lines are permissable.

Note ↑

TERM

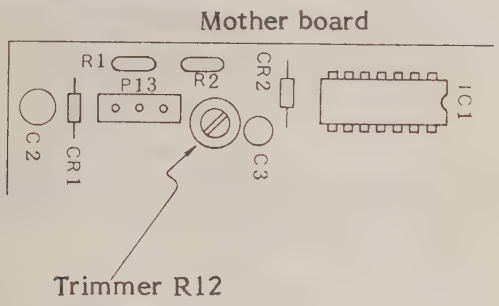
LF, CR

## 3. Adjustments

### 3.1 Adjustment of printer

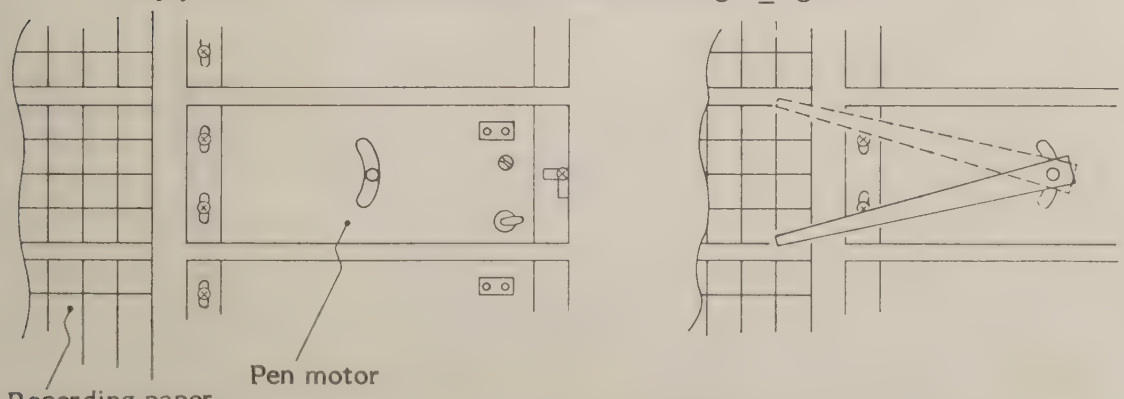
o Standard voltage output V REF (1 V ±0.2%)

1) Remove the panel of the event marker unit of the printer.
2) Turn the trimmer R 12 on the motor board and adjust the voltage between the + and - V REF terminals so that it falls within 1 V ±0.2%.
   The resistance of the V REF output is about 200Ω.




### 3.2 Mounting of pen motor and alignment of heat pen

1) Adjust the motor of the printer by the 3 screws so that the base line of the recording paper and the side of the pen motor are parallel.
2) Loosely attach the pen to the pen motor axis by the setting screw.
3) Move the pen right and left by hand to check its alignment with the scale marks of the recording paper. If it isn't at right angles to the recording paper, loosen the setting screw and readjust the pen position. Confirm the valid stroke range at the same time. The pen tip pressure in both the S and W models is 20 gr. ±3 gr.




Mounting of pen motor

## 3.3 Adjustment of stabilizer (±15 V, ±0.2%)

1) Remove the rear panel of the recorder.

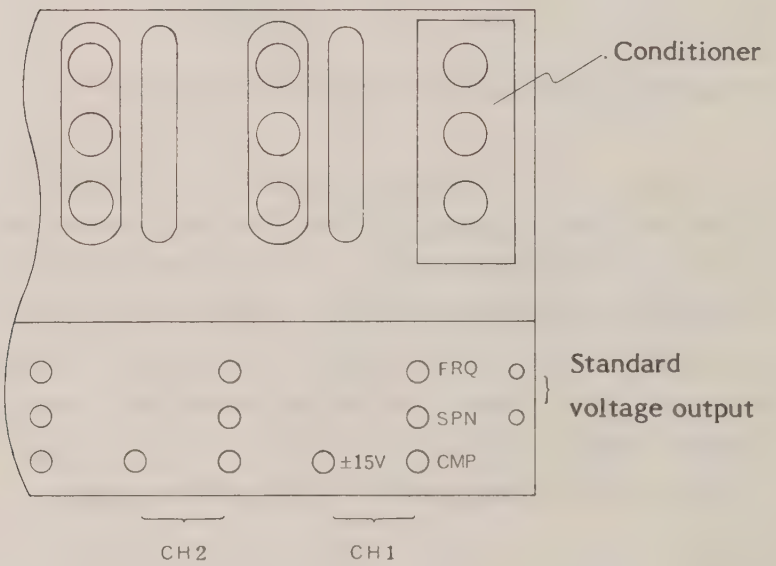
2) Using a flat-blade screw-driver, adjust through the adjusting hole (indicated by "±15 V") on the lower side of the rear panel.

- o The circuit number of the trimmer on the stabilizer board is R6.
- o -15 V falls automatically within the range of ±0.2% by adjusting +15 V.
- o The ±15 V measuring point is at the terminal of connector J8 for the preamplifier. So the preamplifier of the channel being adjusted should be detached.

  +15 V ⟶ B6 pin of J8

  -15 V ⟶ B5 pin of J8

Referring to the negative input terminal (OV)



## 3.4 Adjustment of servo amplifier

There are 4 terminals for adjusting the servo system. One of them is located on the heat control board of the pen motor unit and zeros the bias voltage applied to the potentiometer.

Set all the trimmers around the center

Amplifier input becomes Ø V when HEAT SW is off.

Make the input Ø (Turn HEAT SW: OFF)

The HEAT SW is located on the panel of the pen motor unit.

1) Adjustment of loop gain

Adjust trimmer R9 (COMP) so that TB2 becomes Ø V.

Pay attention to the balance of the servo system, make sure that all are within ±0.2 V.

2) Zero adjustment

Set the pen at the base line of the recording paper's scale marks by trimmer R20 (ZERO)

Trimmer R20 is mounted on the heat control board. (Detach preamplifier for adjustment.)

3) Adjustment of sensitivity

Apply ±2.5 V and adjust trimmer R4 (SPAN) so that the deviation of pen tip is FS.

Single

Apply 10 mm p-p 1 Hz sine wave.

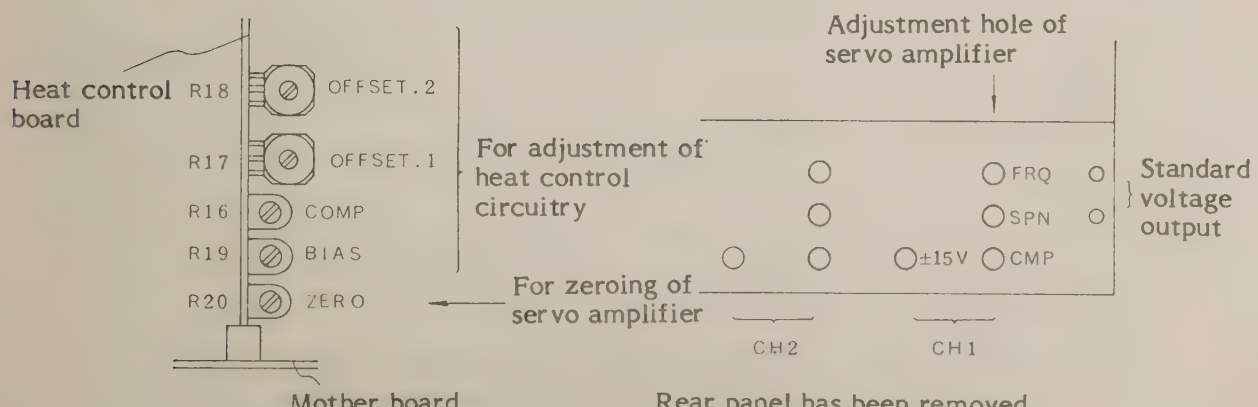
Adjust trimmer R15 (FREQ) so that amplitude is 10 mm p-p when f = 120 Hz.

4) Adjustment of f characteristics

Double

Apply 20 mm p-p 1 Hz sine wave.

Adjust trimmer R5 (FREQ) so that amplitude is 19 mm p-p when f = 60 Hz.



## 3.5 Adjustment of heat control circuitry (applicable to both S and W models)

- o Electric potentials should be all based on TB1 (GND).
- o During the adjustment, replace the heat pen with a 110 Ω (2W) resistor.

1) Offset adjustment
- o Turn HEAT SW (PMTR SW) OFF
- o Reduce paper feeding speed signal VCHRT to Ø V (STOP SW, ON)

OFFSET 1: Adjust trimmer R17 so that TB2 is Ø V.

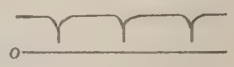
OFFSET 2: Adjust trimmer R18 so that TB3 is Ø V.

2) Gain adjustment
Bias adjustment
COMP

o Turn HEAT SW = ON

Adjust trimmer R16 so that TB2 is approximately 250 mV when pen is twisted by a triangular wave of 1.25 Hz, 40 mm p-p.

Wave form of TB2 +250 mV

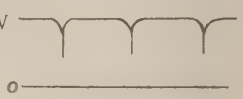


Short-circuit TB4 and TB1 (GND)

$V_0$: voltage between positive terminal of 110 Ω resistor and GND.

Adjust heat control volume so that $V_0$ is approximately 4.2 V when pen is twisted by a triangular wave of 1.25 Hz, 40 mm p-p.

Wave form of $V_0$ +4.2 V



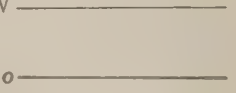
Disconnect the short-circuit between TB4 and TB1 stop the pen.

EXT. SW and HEAT. SW } ON

BIAS

Adjust trimmer R19 so that $V_0$ is approximately 3.8.

$V_0$ wave form +3.8 V



3) Check of limiter

Twist pen by inputting a triangular wave of 10 Hz, 40 mm p-p (approx.).

$V_0 \fallingdotseq 8$ V when feed is less than 19 mm/s
$V_0 \fallingdotseq 13$ V when feed is more than 19 mm/s

4) Recording

Replace the 110 Ω resistor with the heat pen and make a test print. Adjust heat control potentiometer.

## 3.6 Adjustment of preamplifier

1) Balance adjustment (L amplifier doesn't have a BAL2 trimmer.)

Set all the trimmers around the center.

↓

Turn input switch off Set MULTIPLY to mV.

↓

BAL 1 — Adjust trimmer R12 (BAL1) so that pen position at max. sensitivity coincides with that at min. sensitivity.

↓

Turn input switch to MEAS (Input open)

↓

BAL2 — Adjust trimmer R6 (BAL2) so that pen position when at MEAS coincides with that when at off.

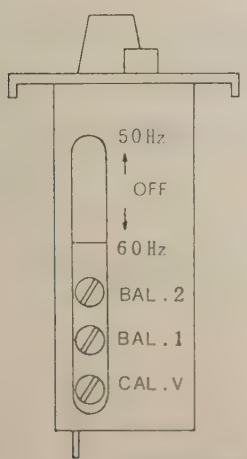
2) Gain adjustment

| Single | Double |
|---|---|
| Set the range to 500 mV/cm, and the pen at the center (base line). | Set the range to 250 mV/cm, and the pen at the center (base line). |
| GAIN (panel) — Adjust the gain potentiometer so that pen can be moved by 20 mm when 1 V is applied. | Adjust the gain potentiometer so that pen can be moved by 40 mm when 1 V is applied. |

3) Calibration voltage adjustment

| | |
|---|---|
| Adjust trimmer R24 (CAL.V) so that pen can be moved by 20 mm when pen is set to the center (base line) and input switch is turned to CAL.V. | Adjust trimmer R24 (CAL.V) so that pen can be moved by 40 mm when pen set at the center (base line) and input switch is turned to CAL.V. |

CAL.V




H amplifier trimmer adjustment panel

Note 1) BAL1 is adjusted if the pen tip moves (0.3 mm or more) when the range potentiometer is turned.

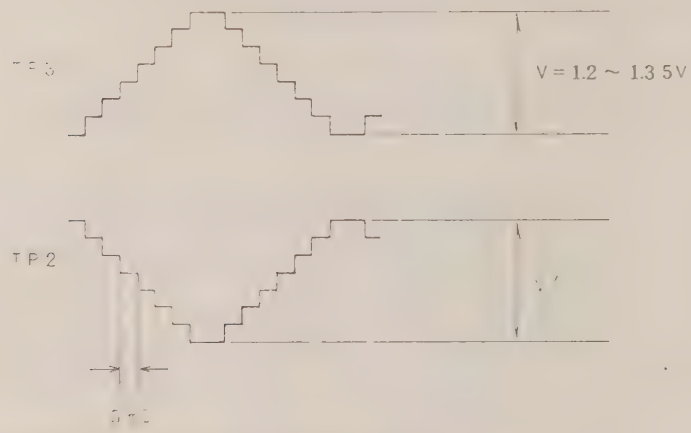
Note 2) BAL2 is adjusted if the pen tip moves (0.3 mm or more) when MULTIPLY SW is turned.

## 3.7 Adjustment of paper feeding circuitry

(All channels of pen motor's HEAT SW, should be turned off. Marker's connector should be pulled out.)

During the following adjustment, the connectors J1 (DC motor, etc.) and J4 (pulse motor) should be disconnected from the printer.

1) PR 3101-02 (controller) TP2, TP3 readjustment (based on TP1 (GND))
This should be done at a feeding speed of 5 mm/sec.

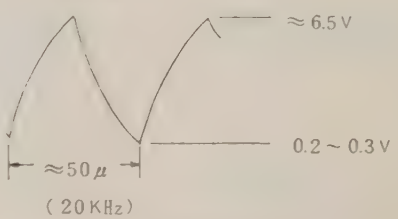



VR1 is adjusted so that V' coincides with V.

2) PR3101-13 (driver) TP1, TP2, TP3 readjustment (based on GND)

TP1 Adjust by VR2 so that it is Ø V when STOP SW is on.

TP2 Set the LOW LEVEL to 0.2 - 0.3 V by VR1.

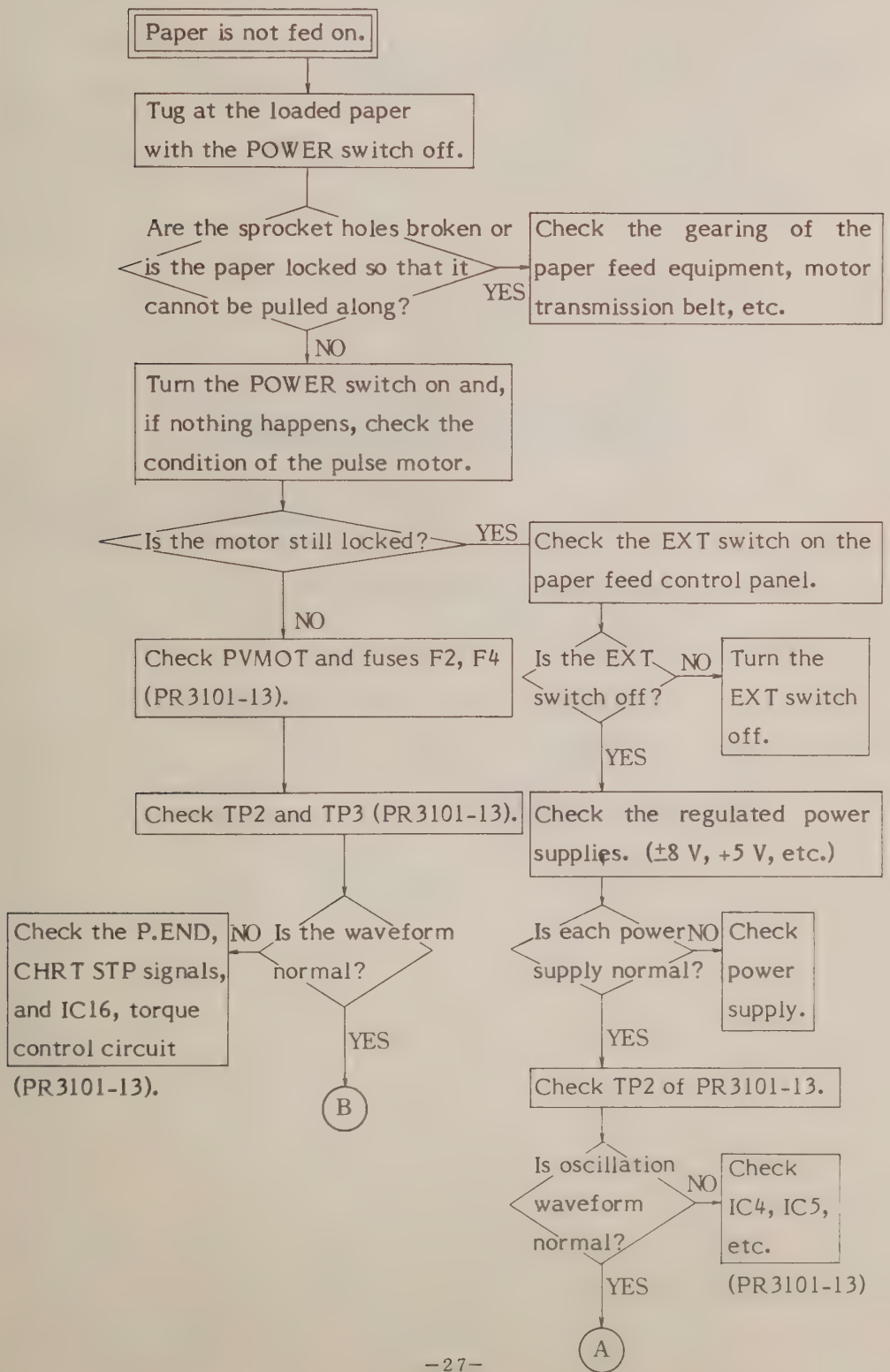


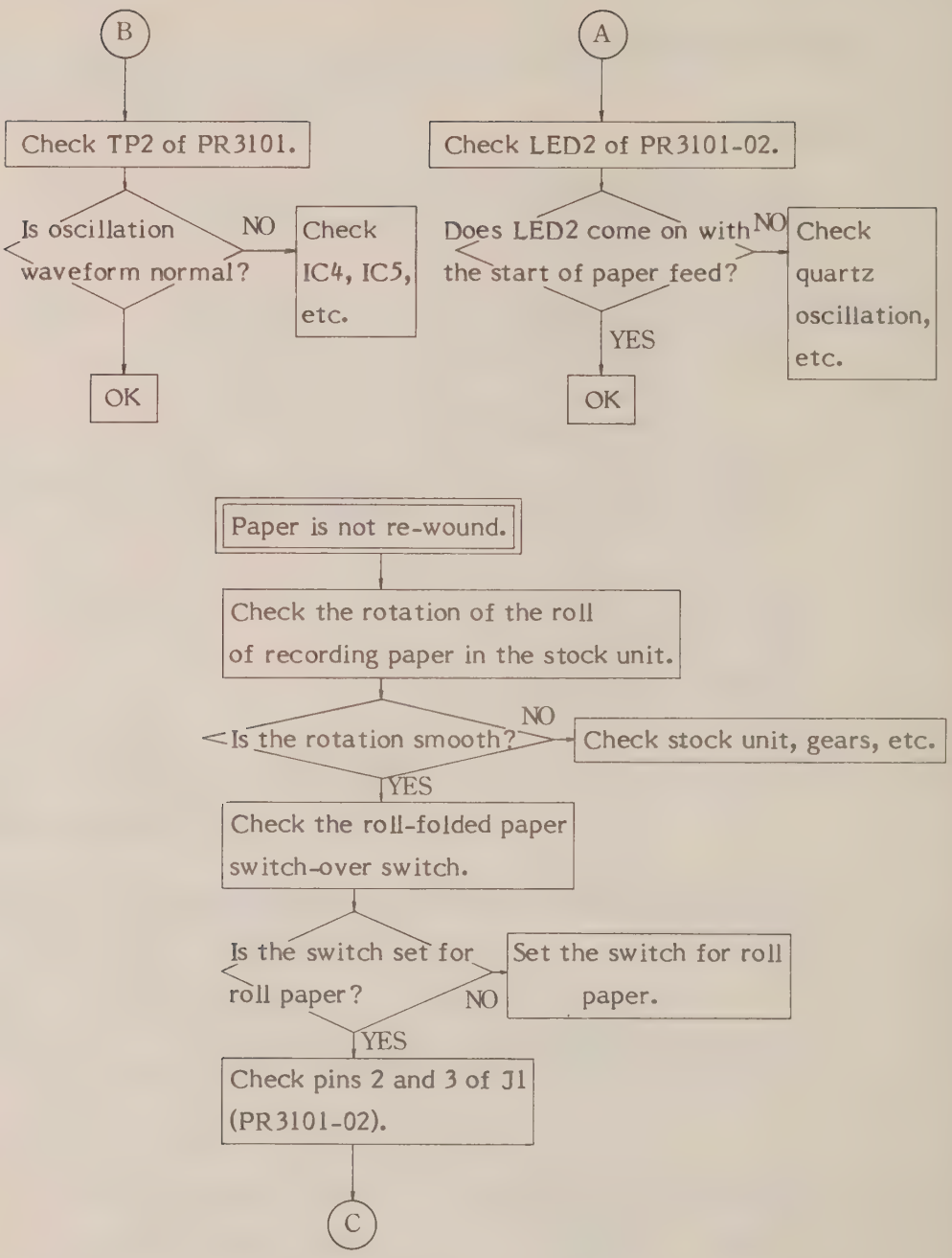

TP3 Adjust by VR3 so that TP3 is 8 V at a feeding speed of 10 mm/sec.

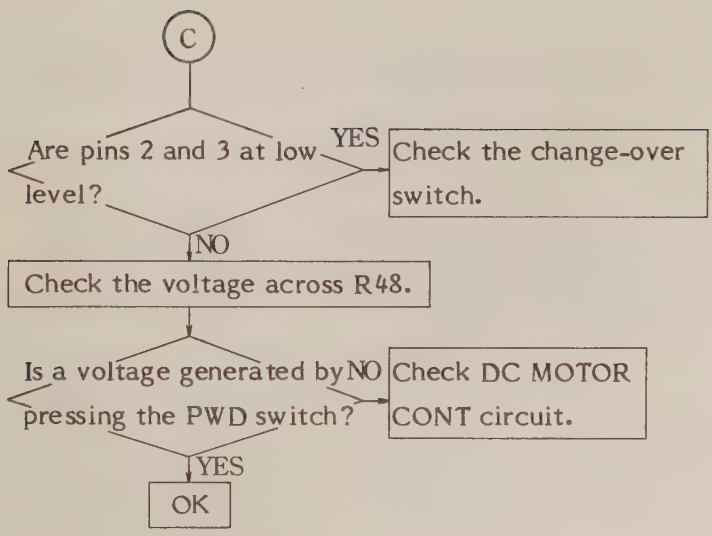
After all the above is completed, turn POWER SW off and connect all the connecters.

# 4. TROUBLESHOOTING

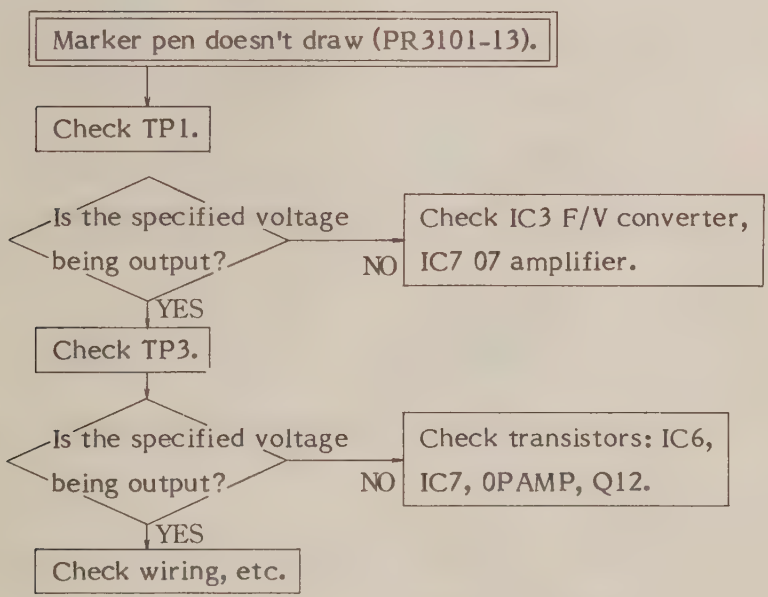
## 4-1 Paper feed


Paper is not fed on.
Tug at the loaded paper with the POWER switch off.
Are the sprocket holes broken or is the paper locked so that it cannot be pulled along?
YES
Check the gearing of the paper feed equipment, motor transmission belt, etc.
NO
Turn the POWER switch on and, if nothing happens, check the condition of the pulse motor.
Is the motor still locked?
YES
Check the EXT switch on the paper feed control panel.
NO
Check PVMOT and fuses F2, F4 (PR3101-13).
Is the EXT switch off?
NO
Turn the EXT switch off.
YES
Check TP2 and TP3 (PR3101-13).
Check the regulated power supplies. (±8 V, +5 V, etc.)
Check the P.END, CHRT STP signals, and IC16, torque control circuit (PR3101-13).
NO
Is the waveform normal?
YES
B
Is each power supply normal?
NO
Check power supply.
YES
Check TP2 of PR3101-13.
Is oscillation waveform normal?
NO
Check IC4, IC5, etc. (PR3101-13)
YES
A

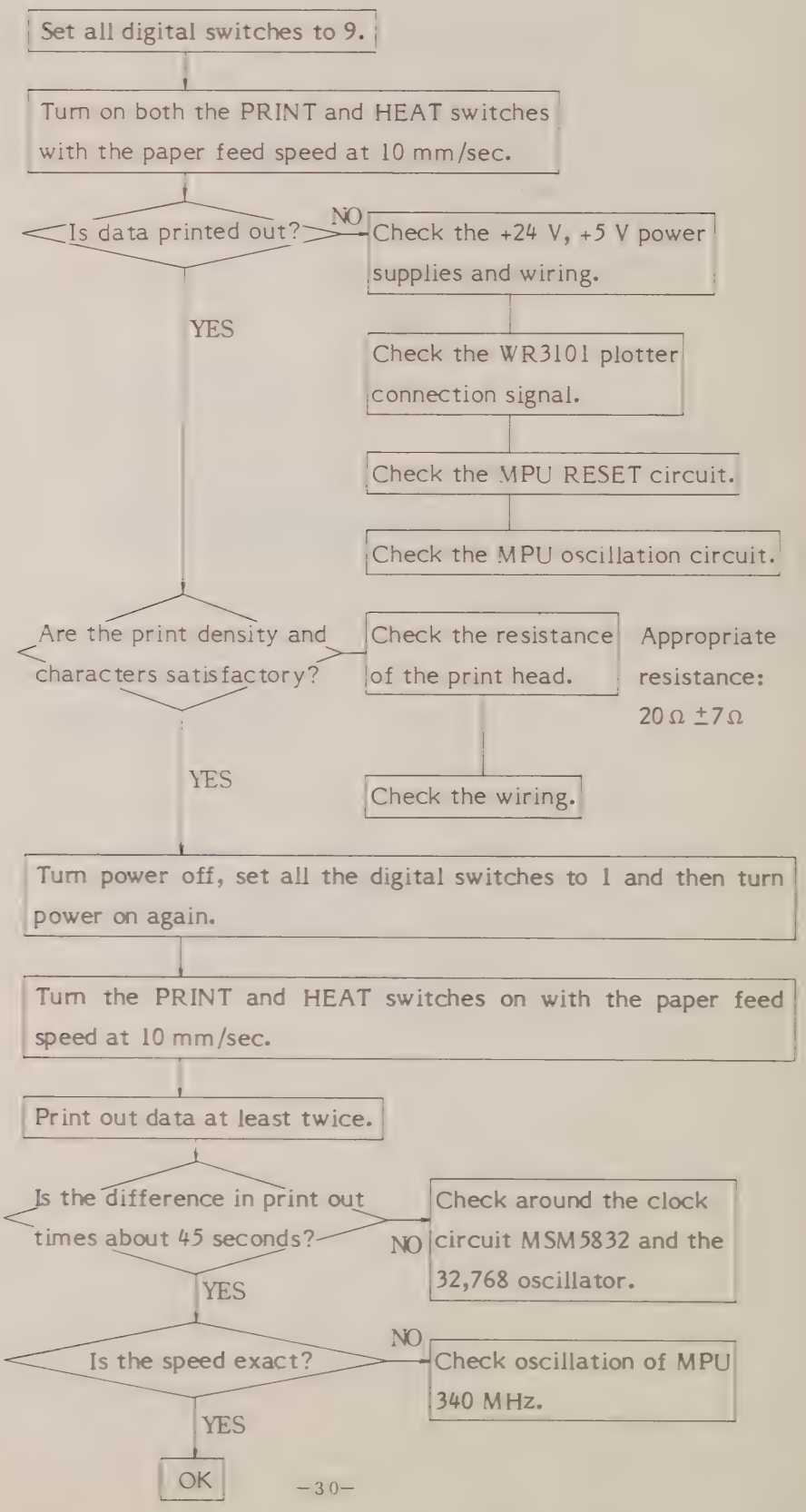

B
Check TP2 of PR3101.
Is oscillation waveform normal?
NO
Check IC4, IC5, etc.
OK
A
Check LED2 of PR3101-02.
Does LED2 come on with the start of paper feed?
NO
Check quartz oscillation, etc.
YES
OK
Paper is not re-wound.
Check the rotation of the roll of recording paper in the stock unit.
Is the rotation smooth?
NO
Check stock unit, gears, etc.
YES
Check the roll-folded paper switch-over switch.
Is the switch set for roll paper?
NO
Set the switch for roll paper.
YES
Check pins 2 and 3 of J1 (PR3101-02).
C

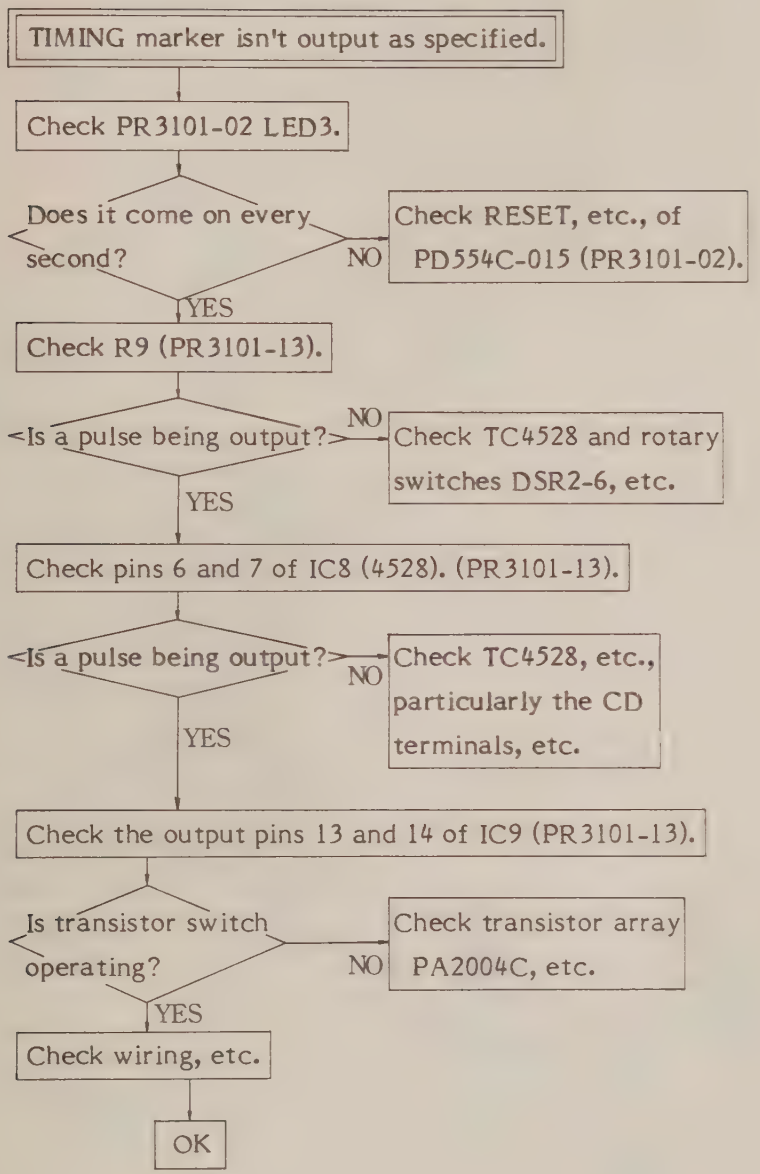

C
Are pins 2 and 3 at low level?
YES
Check the change-over switch.
NO
Check the voltage across R48.
Is a voltage generated by pressing the PWD switch?
NO
Check DC MOTOR CONT circuit.
YES
OK

## 4-2 Marker

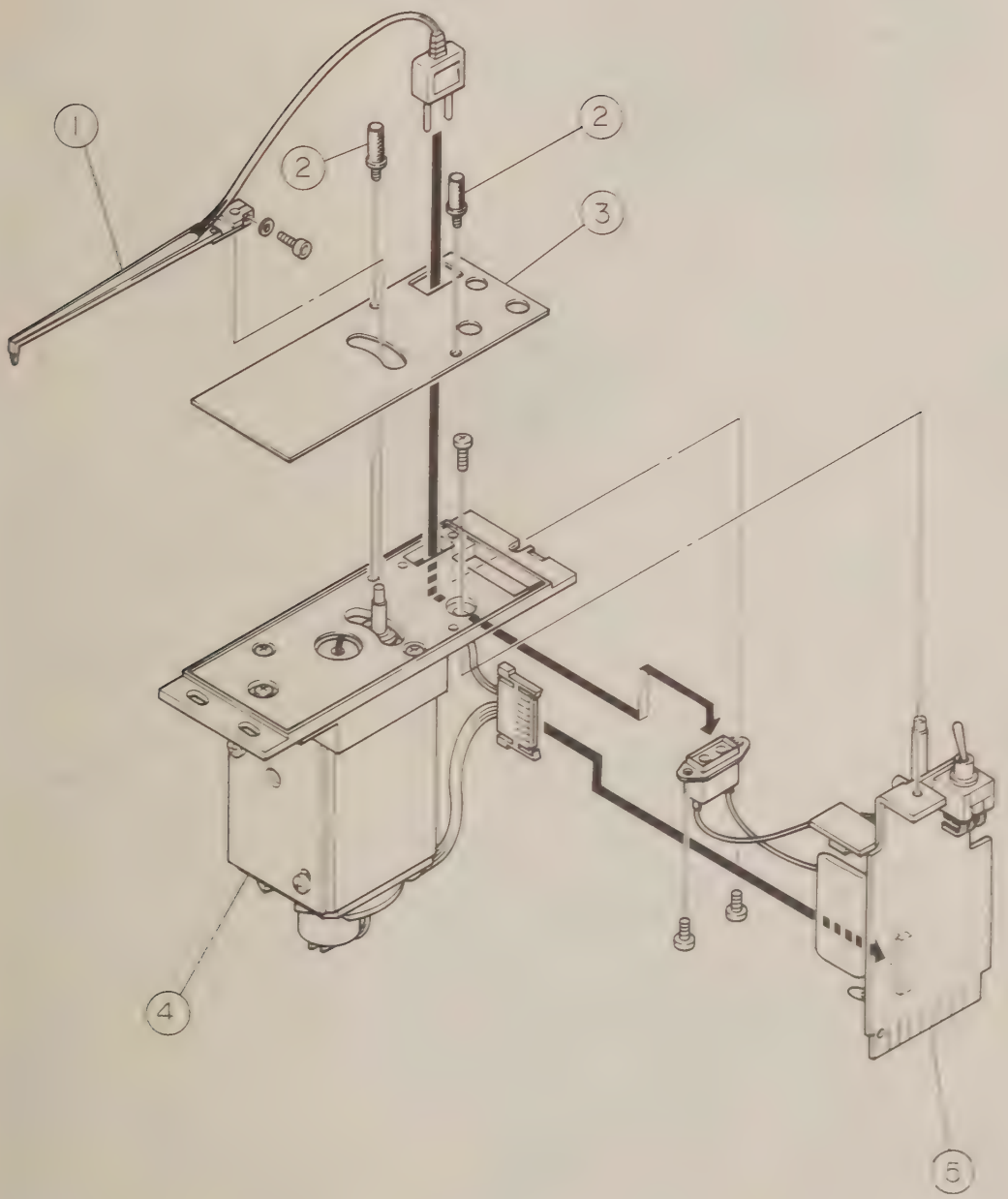

Marker pen doesn't draw (PR3101-13).
Check TP1.
Is the specified voltage being output?
NO
Check IC3 F/V converter, IC7 07 amplifier.
YES
Check TP3.
Is the specified voltage being output?
NO
Check transistors: IC6, IC7, 0PAMP, Q12.
YES
Check wiring, etc.

## 4-3 Printer (internal mode)


Set all digital switches to 9.
Turn on both the PRINT and HEAT switches with the paper feed speed at 10 mm/sec.
Is data printed out?
NO
Check the +24 V, +5 V power supplies and wiring.
YES
Check the WR3101 plotter connection signal.
Check the MPU RESET circuit.
Check the MPU oscillation circuit.
Are the print density and characters satisfactory?
Check the resistance of the print head.
Appropriate resistance: 20Ω ±7Ω
YES
Check the wiring.
Turn power off, set all the digital switches to 1 and then turn power on again.
Turn the PRINT and HEAT switches on with the paper feed speed at 10 mm/sec.
Print out data at least twice.
Is the difference in print out times about 45 seconds?
NO
Check around the clock circuit MSM5832 and the 32,768 oscillator.
YES
Is the speed exact?
NO
Check oscillation of MPU 340 MHz.
YES
OK


TIMING marker isn't output as specified.
Check PR3101-02 LED3.
Does it come on every second?
NO
Check RESET, etc., of PD554C-015 (PR3101-02).
YES
Check R9 (PR3101-13).
<Is a pulse being output?>
NO
Check TC4528 and rotary switches DSR2-6, etc.
YES
Check pins 6 and 7 of IC8 (4528). (PR3101-13).
<Is a pulse being output?>
NO
Check TC4528, etc., particularly the CD terminals, etc.
YES
Check the output pins 13 and 14 of IC9 (PR3101-13).
Is transistor switch operating?
NO
Check transistor array PA2004C, etc.
YES
Check wiring, etc.
OK

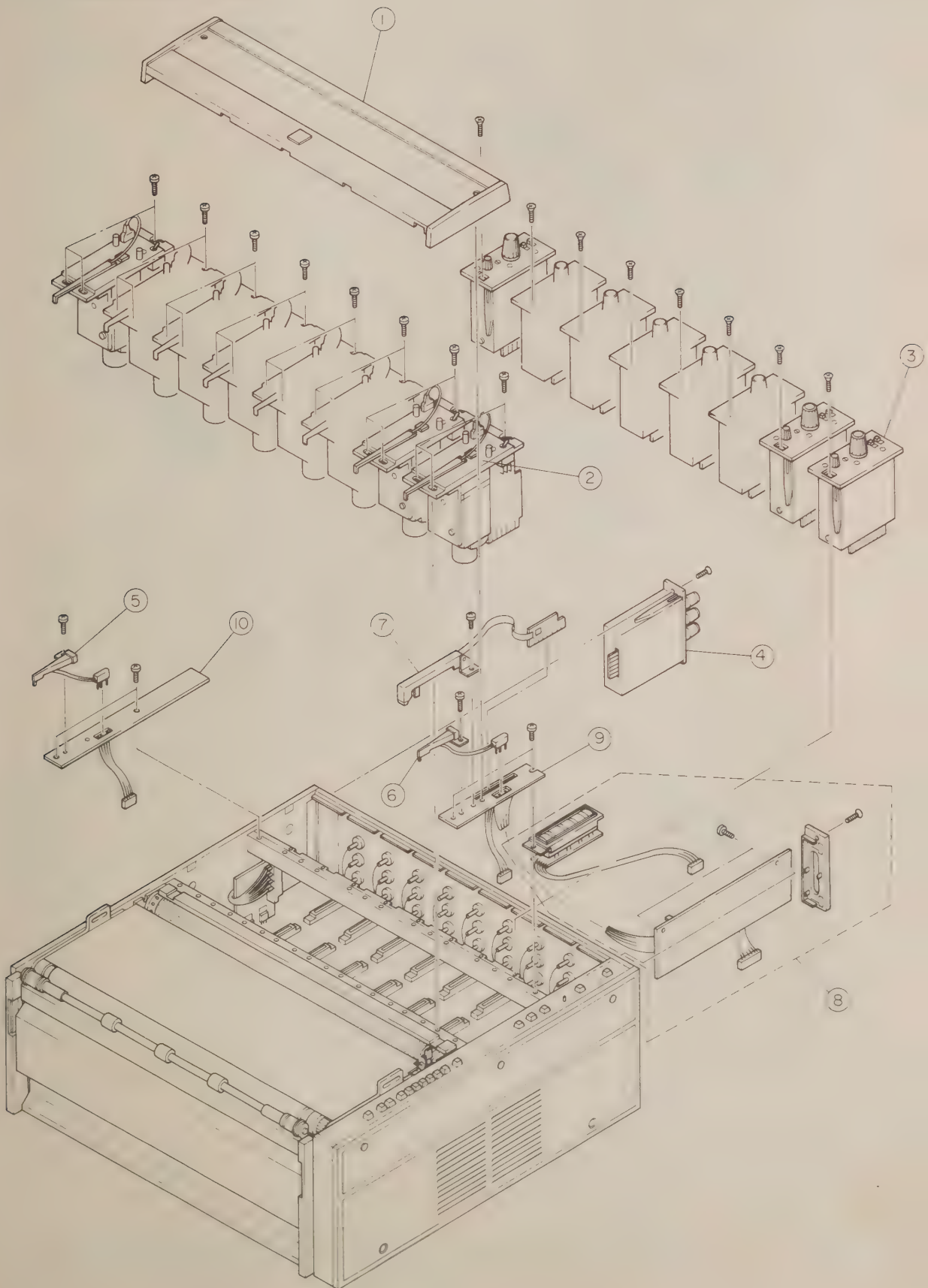
## Pen Motor Mechanism



## Pen Motor Mechanism

| Item | Part & Block No. | Desctiption | | Remarks |
|---|---|---|---|---|
| 1 | 772310114 | Pen, KT-201 (40mmP-P) | | |
| | 772310124 | Pen, KT-202 (80mmP-P) | | |
| 2 | 031013700 | Knob | | |
| 3 | 031013510 | Panel (40mmP-P) | | |
| | 031013550 | Panel (80mmP-P) | | |
| 4 | 772310115 | Pen Motor (40mm P-P) | | |
| | 772310121 | Pen Motor (80mmP-P) | | |
| 5 | 772310113 | Heat-Control (40mmP-P) unit | | |
| | 772310123 | Heat-Control (80mmP-P) unit | | |

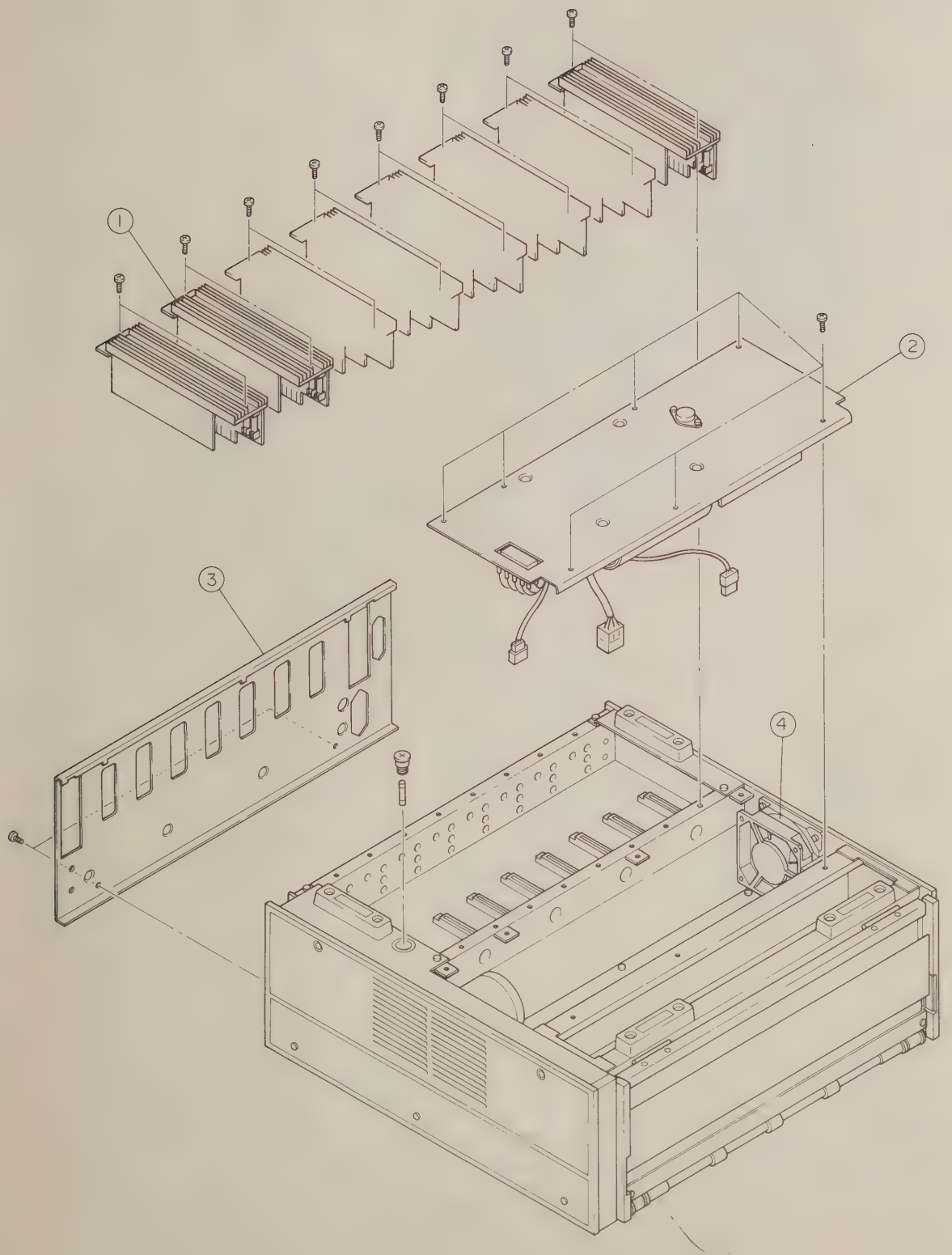
## Pen Control And Pre Amp Unit



## Pen Control And Pre Amp Unit

| Item | Part & Block No. | Description | | Remarks |
|---|---|---|---|---|
| 1 | 031015340 | Pen Cover (2 Pen) | | |
| | 031015530 | Pen Cover (4 Pen) | | |
| | 031015630 | " (6 Pen) | | |
| | 031015730 | " (8 Pen) | | |
| | 031015830 | " (12 Pen) | | |
| 2 | 802310110 | Pen Motor (40mm P-P) | GS3101 | |
| | 802310120 | Pen Motor (80mm P-P) | GW3101 | |
| 3 | 804310130 | AL3101 (L Type) | | |
| | 804310140 | AH3101 (H Type) | | |
| | 804310150 | AL3102 (DL Type) | | |
| | 804310160 | AH3102 (DH Type) | | |
| 4 | 774310110 | Conditioner Box | | |
| 5 | 731014320 | KT-203 (Pen Marker) | | |
| 6 | 731014320 | KT-209 (Pen Timing) | | |
| 7 | 771310185 | KT-208, Print-Head (Thermal) | | |
| 8 | 771310186 | Print Control | | |
| 9 | 031015180 | Timing Panel | | |
| 10 | 031015300 | Marker Panel | | |

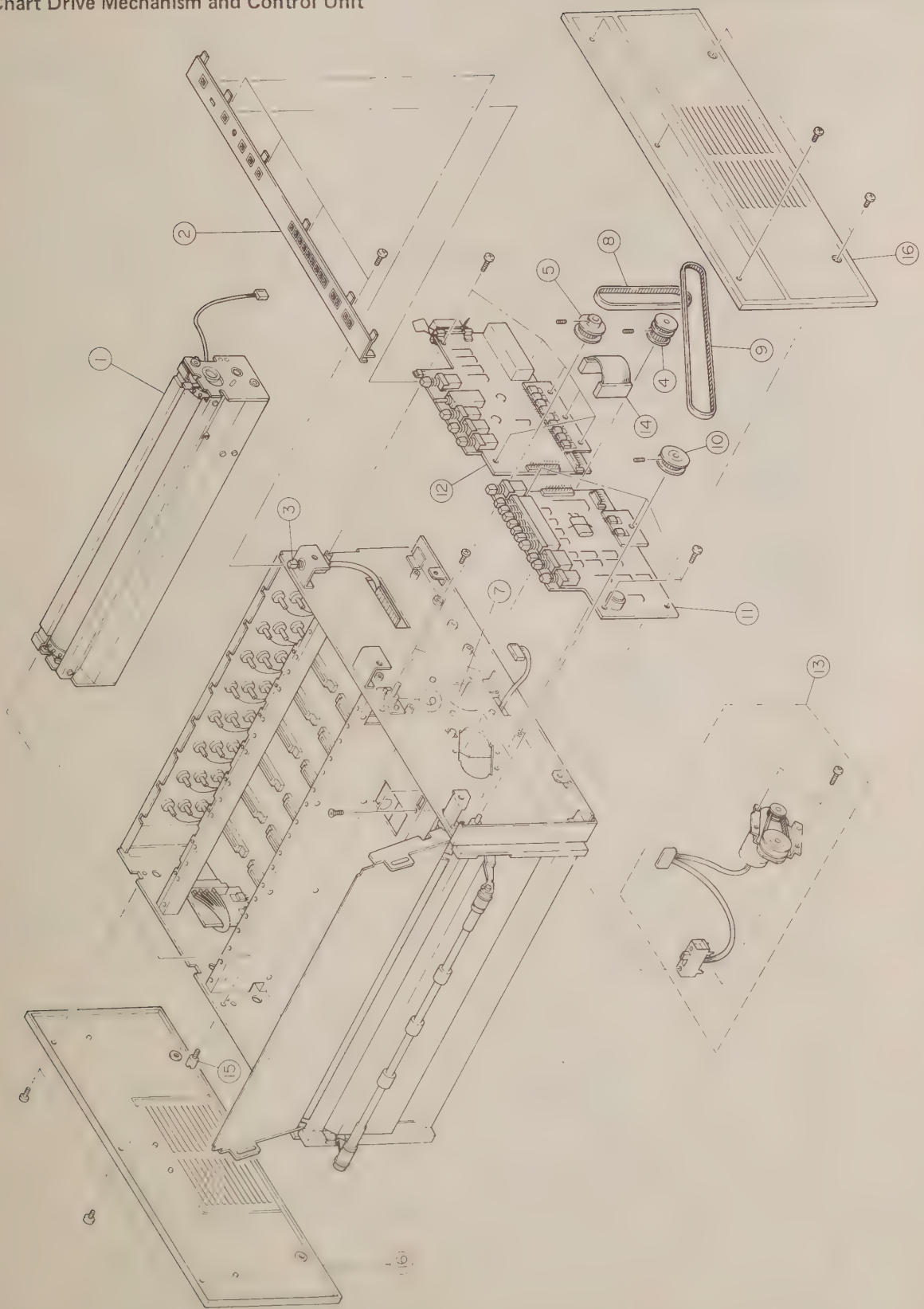
## Bottom Side Assembly



## Bottom Side Assembly

| Item | Part & Block No. | Description | | Remarks |
|---|---|---|---|---|
| 1 | 804310113 | Main Amplifier (Ampl 40mmP-P) | | |
| | 804310122 | Main Amplifier (Ampl 90mmP-P) | | |
| 2 | 771310166 | Power Circuit Block (2 Pen) | | |
| | 771310167 | " (4 Pen) | | |
| | 771310168 | " (6 Pen, 8 Pen) | | |
| | 771310170 | " (12 Pen) | | |
| 3 | 031015350 | Back Cover (2 Pen) | | |
| | 031015540 | " (4 Pen) | | |
| | 031015640 | " (6 Pen) | | |
| | 031015741 | " (8 Pen) | | |
| | 031015841 | " (12 Pen) | | |
| 4 | 509600004 | Fan Motor PXJ43B1 | | |

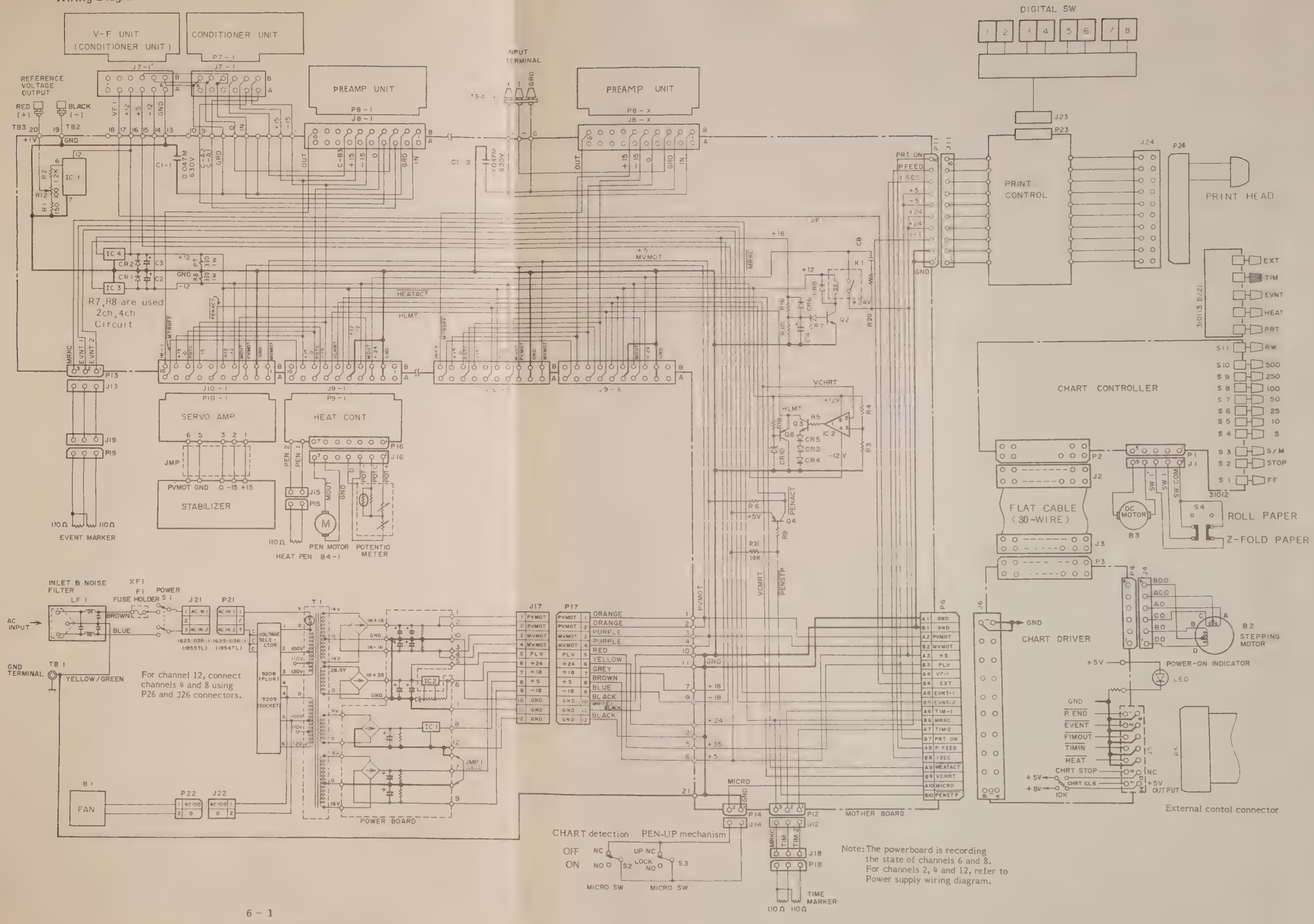
## Chart Drive Mechanism and Control Unit



## Chart Drive Mechanism and Control Unit

| Item | Part & Block No. | Description | | Remarks |
|---|---|---|---|---|
| 1 | 771310123 | Chart Drive Mechanism Block (2 Pen) | | |
| | 771310124 | " (4 Pen) | | |
| | 771310125 | " (6 Pen) | | |
| | 771310126 | " (8 Pen) | | |
| | 771310127 | " (12 Pen) | | |
| 2 | 031015130 | Control Panel | | |
| 3 | 508101010 | Switch Power, 1P-0008AC1920 | | |
| 4 | 731016010 | Gear-A | | |
| 5 | 731016050 | Gear-B | | |
| 6 | 031016080 | Drive Shaft | | |
| 7 | 509410001 | Stepping Motor KP6R2-011 | | |
| 8 | 373201002 | Synchro Belt 112MXL6.4 | | |
| 9 | 373101010 | Synchro Belt 224MXL3.2 | | |
| 10 | 731016090 | Gear-C | | |
| 11 | 771310177 | Chart Control Unit PR31012 | | |
| 12 | 771310176 | Chart Driver Unit PR310113 | | |
| 13 | | Rewind Mechanism | | |
| 14 | 520110060 | Flat Cable with Connector L42-30P | | |
| 15 | 031012100 | Screw, Chart Drive Block | | |
| 16 | 031015020 | Side Cover | | |

## Wiring Diagram



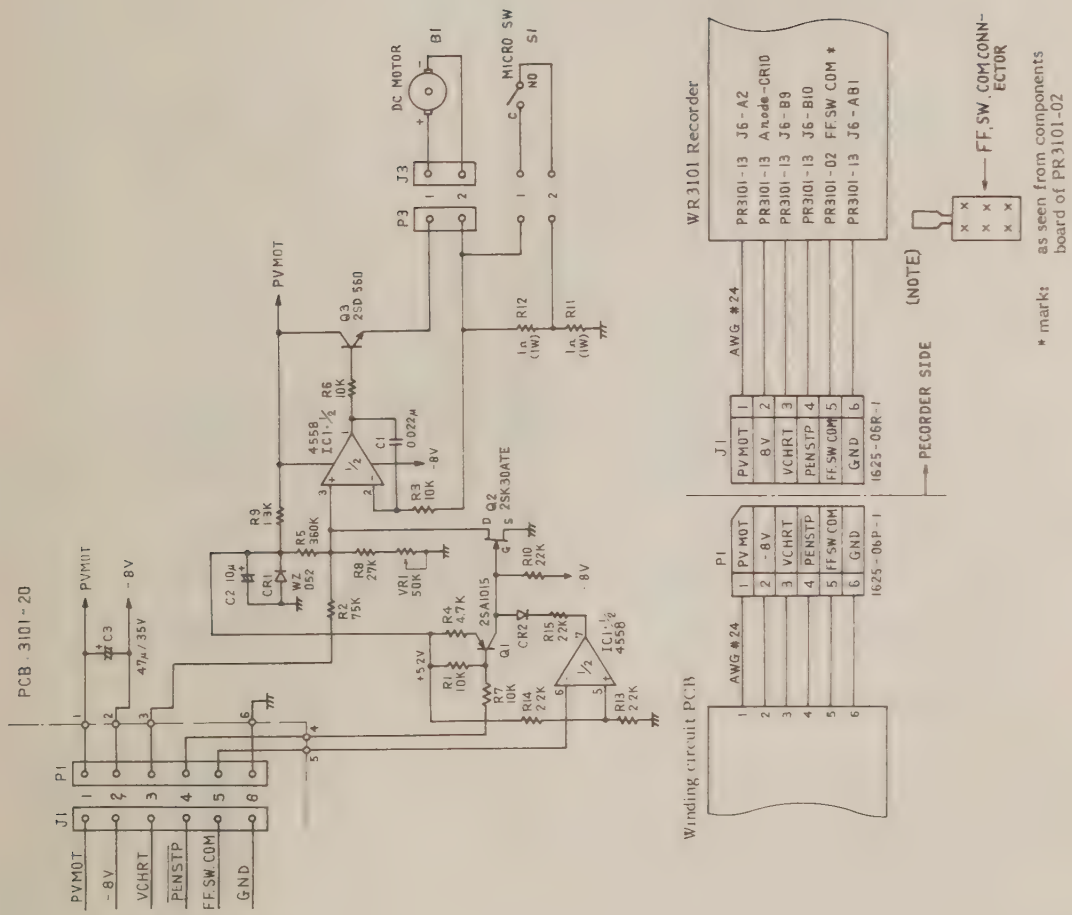
## Wiring Diagram

| Figure | Part No. | Description | | Type | Remarks |
|---|---|---|---|---|---|
| W1 | 520100017 | AC Cord | | DC011-001 | |
| LF1 | 518110004 | Line Filter | 6A | 610G6 | |
| XF1 | 512400002 | Fuse Holder | | SN-2056 | |
| S1 | 508101010 | Switch, Push | AC250V, 4A | 1P-0008AC1920 | |
| S2 | 508401004 | " Micro | | CC-5-R | |
| S3 | 508401010 | " Micro | | SS-5GL | |
| S4 | 508302005 | " Slide | | SSB022L6, R, NS | |
| TB1 | 514400004 | Terminal | | SQ0204-02 | |
| TB2 | 514400005 | " | Red | PTJ470A2 | |
| TB3 | 514400006 | " | Black | PTJ470A0 | |
| TB4-X | 514400010 | Input Terminal | 3P Red | W—R | x 2 x CH |
| | 514400011 | Input Terminal | 3P Black | W—B | x CH |
| J1 | 513400044 | Connector, Receptacle | 5P | HNC2-2.5S-5 | |
| CNP | 513400037 | Contact Pin | | HNC-2.5S-A | x 5, For J1 |
| J4 | 513400036 | Connector, Receptacle | 4P | HNC2-2.5S-6 | |
| CNP | 513400037 | Contact Pin | | HNC-2.5S-A | x 6, For J4 |
| P5 | 513100321 | Connector, Plug | 14P | 57-30140 | For EXT Cont. |
| J7 | 513300609 | Connector | 6P x 2 | 225J20621-488 | |
| J12 | 513400041 | Connector, Receptacle | 3P | HNC2-2.5S-3 | |
| CNP | 513400042 | Contact Pin | | HNC-2.5S-B | x 3, For J12 |
| J13 | 513400041 | Connector, Receptacle | 3P | HNC2-2.5S-3 | |
| CNP | 513400042 | Contact Pin | | HNC-2.5S-B | x 3, For J13 |
| J14 | 513400043 | Connector, Receptacle | 2P | HNC2-2.5S-2 | |
| CNP | 513400042 | Contact Pin | | HNC-2.5S0B | x 2, For J14 |
| J18 | 513200311 | Connector, Receptacle | 3P | 3965-SC | Pair |
| P18 | | " , Plug | 3P | | |
| J19 | 513200311 | Connector, Receptacle | 3P | 3965-SC | Pair |
| P19 | | " , Plug | 3P | | |
| J21 | 513200302 | Connector, Receptacle | 3P | 1625-3R | |
| CNP | 513400022 | Contact Pin | | 1561TL | x 2, For J21 |
| P22 | 513200202 | Connector, Plug | 2P | 1625-2P-1 | |
| CNP | 513400001 | Contact Pin | | 1854TL | x2, For P22 (For 6CH 8CH 12CH) |
| B1 | 509600004 | Fan Motor | AC100V | PXJ43B1 | |
| B2 | 509410001 | Stepping Motor | | KP6R2-011 | |
| B3 | 509100017 | DC Motor, Coreless, | DC24V | LN30-N21N1 | |
| Cap | 516100009 | Cap, | Red | B101 | For S1 |

## Wiring Diagram

| Figure | Part No. | Description | | Type | Remarks |
|---|---|---|---|---|---|
| F1 | 512300027 | Fuse, Time Lag | 4A | F102-SGA-4A | For 2CH, 4CH, 6CH (AC100V, 117V) |
| F1 | 512300028 | Fuse, Time Lag | 6A | F102-SGA-6A | For 8CH, 12CH (AC100V, 117V) |
| F1 | 512300029 | Fuse, Time Lag | 2A | F102-SGA-2A | For 2CH, 4CH, 6CH (AC220V, 240V) |
| F1 | 512300031 | Fuse, Time Lag | 3A | F102-SGA-3A | For 8CH, 12CH (AC220V, 240V) |
| S-Bar | 004407010 | Short Bar | | | x CH |

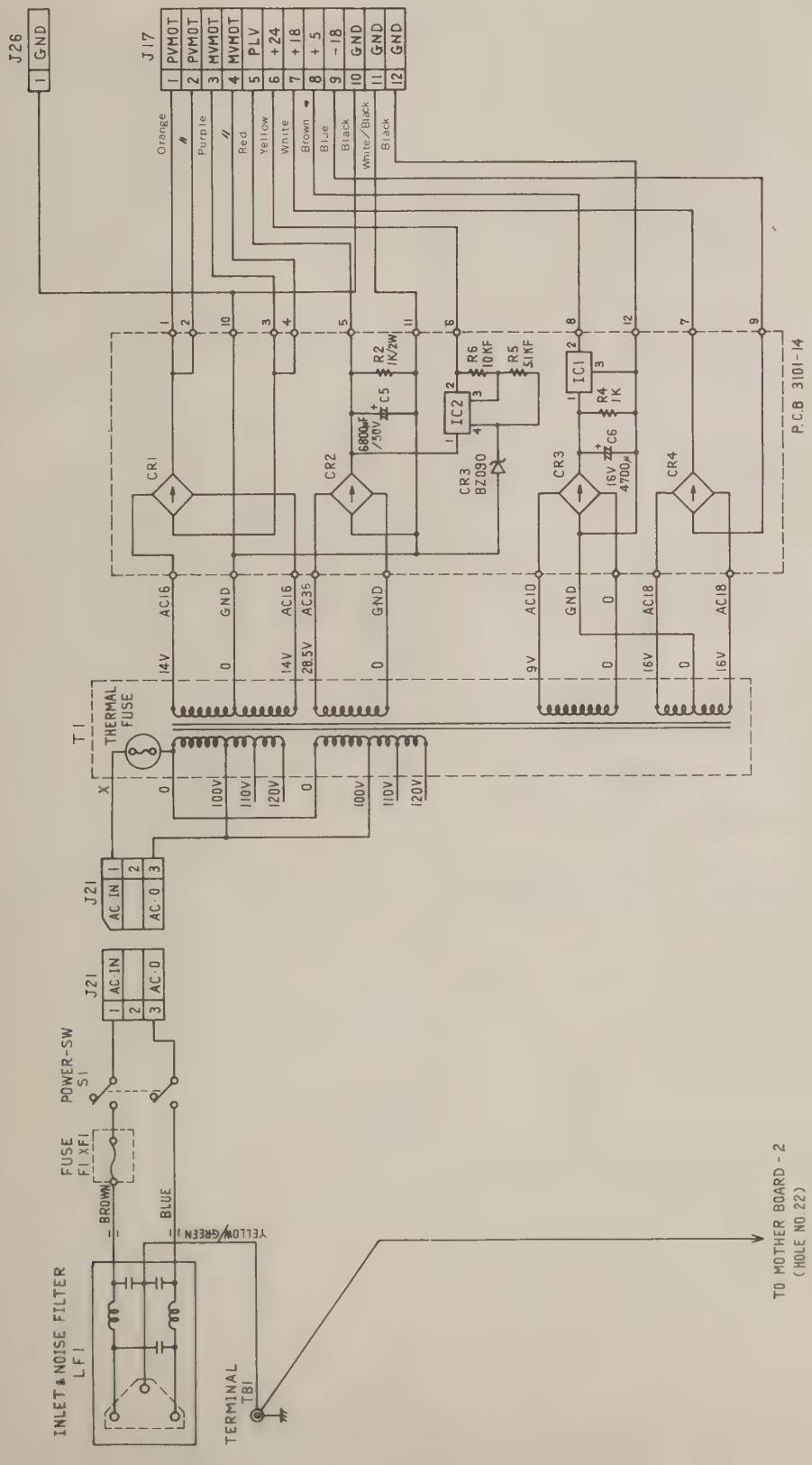
## Winding circuit



## Winding Circuit

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | G501203725 | R, Solid | 10K | 1/4W | ±5% | RC1/4-10KJ | |
| R2 | G501303757 | R, Metal Film | 75K | 1/4W | ±5% | RNE1/4-75KJ | |
| R3 | G501203725 | R, Solid | 10K | 1/4W | ±5% | RC1/4-10KJ | |
| R4 | G501203722 | R, Solid | 4.7K | 1/4W | ±5% | RC1/4-4.7KJ | |
| R5 | J 501330104 | R, Metal Film | 360K | 1/4W | ±5% | RNE1/4-360KJ | |
| R6 | G501203725 | R, Solid | 10K | 1/4W | ±5% | RC1/4-10KJ | |
| R7 | " | R, " | " | " | " | " | |
| R8 | G501303752 | R, Metal Film | 27K | 1/4W | ±5% | RNE1/4-27KJ | |
| R9 | G501303751 | R, " | 1.3K | 1/4W | ±5% | RNE1/4-22KJ | |
| R10 | J 501203727 | R, Solid | 22K | 1/4W | ±5% | RC1/4-22KJ | |
| R11 | J 501605711 | R, Metal Film | 1 | 1W | ±5% | RSFIB-1J | |
| R12 | " | R, " | 1 | 1W | ±5% | " | |
| R13 | G501203719 | R, Solid | 2.2K | 1/4W | ±5% | RC1/4-2.2KJ | |
| R14 | " | R, " | " | " | " | " | |
| R15 | " | R, " | " | " | " | " | |
| C1 | G502303008 | C, Myler Film | 0.022μ | 50WV | | MFL-05S22 | |
| C2 | G502203002 | C, Tantalum | 10μ | 16WV | | CS15EIC100M | |
| C3 | J 502103028 | C, Electrolytic | 47μ | 35WV | | SM35VB-47 | |
| CR1 | A503100060 | Di, Zener | $V_Z$=5.2V | | | WZ052 | |
| CR2 | G503100020 | Di, Si | $V_R$=30V | $I_F$=100mA | | IS953 | |
| IC1 | G503300054 | IC, Op-Amp | Dual | | | NJM4558D | |
| S1 | A508401004 | Switch, Micro | | | | CC-5-R | |
| Q1 | G503203016 | T, PNP | –30V | –100mA | 200mW | 2SA1015, Y | |
| Q2 | A503200027 | T, N-J-FET | | | | 2SK30A | |
| Q3 | A503200028 | T, NPN | 100V | 5A | 1.5W | 2SD560, L | |
| | B520100012 | Insulating Sheet | | | | 30B6001 | For Q3 |
| VR1 | B504207038 | R, Trimmer Cermet | 50K | | | TM10KPV50K | |
| B1 | A509100017 | DC Motor, Coreless | DC24V | | | LN30-N21N1 | |
| P1 | A513200601 | Connector, Plug | 6P | | | 1625-06P-1 | |
| CNP | G513400001 | Contact Pin | | | | 1854-TL | For P1 |
| P3 | B513400038 | Connector, Pin Header | 2P | | | HNC2-2, 5P2DS | |
| J1 | A513200602 | Connector, Receptacle | 6P | | | 1625-06R-1 | |
| CNP | G513400002 | Contact Pin | | | | 1855-TL | For J1 |
| J3 | B513400043 | Connector, Receptacle | 2P | | | HNC2-2.5S-2 | |
| CNP | B513400037 | Contact Pin | | | | HNC-2.5S-A | For J3 |
| PCB | 511310200 | Printed Circuit Board | | | | 3101-20 | |

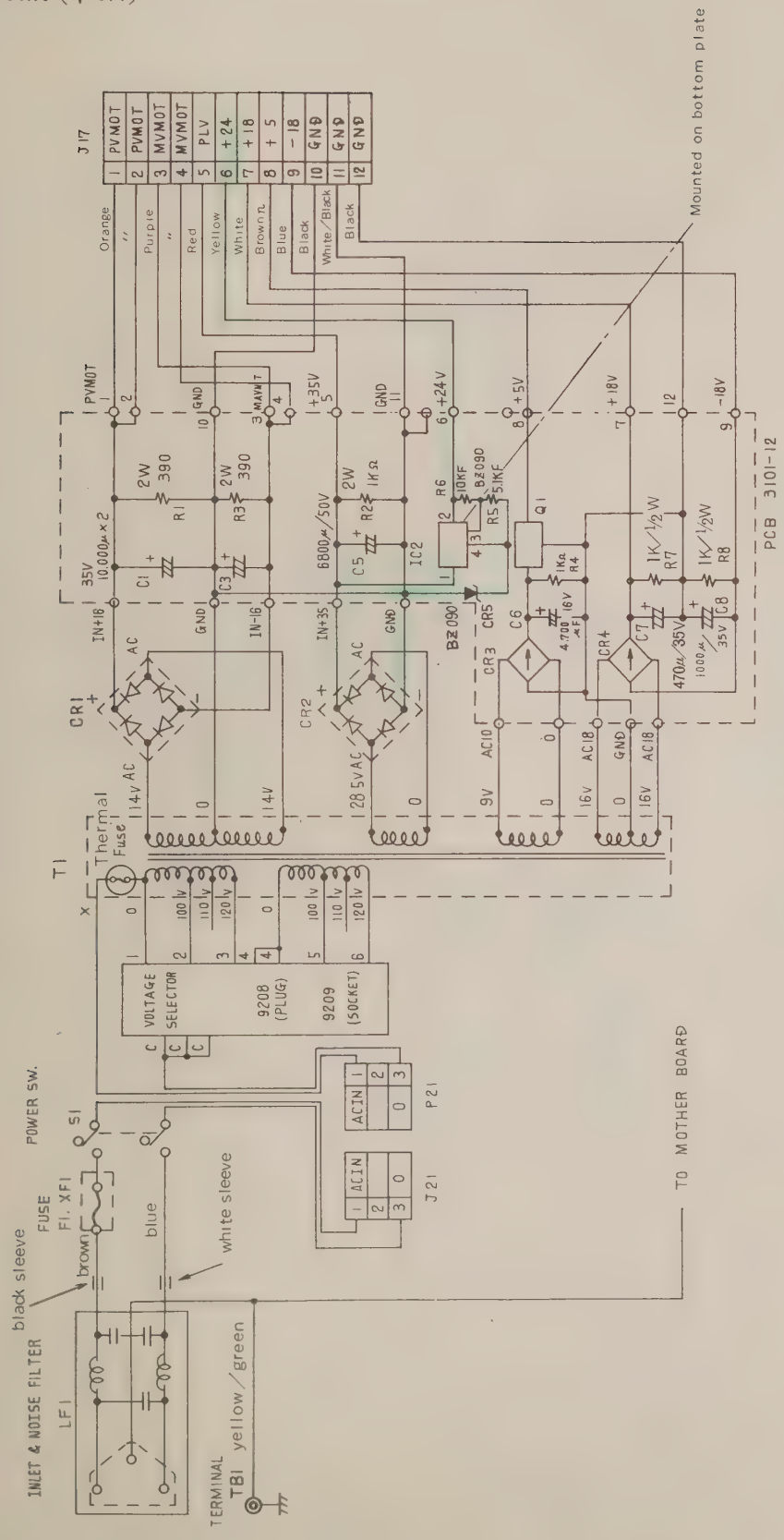
## Power Unit (2 CH)



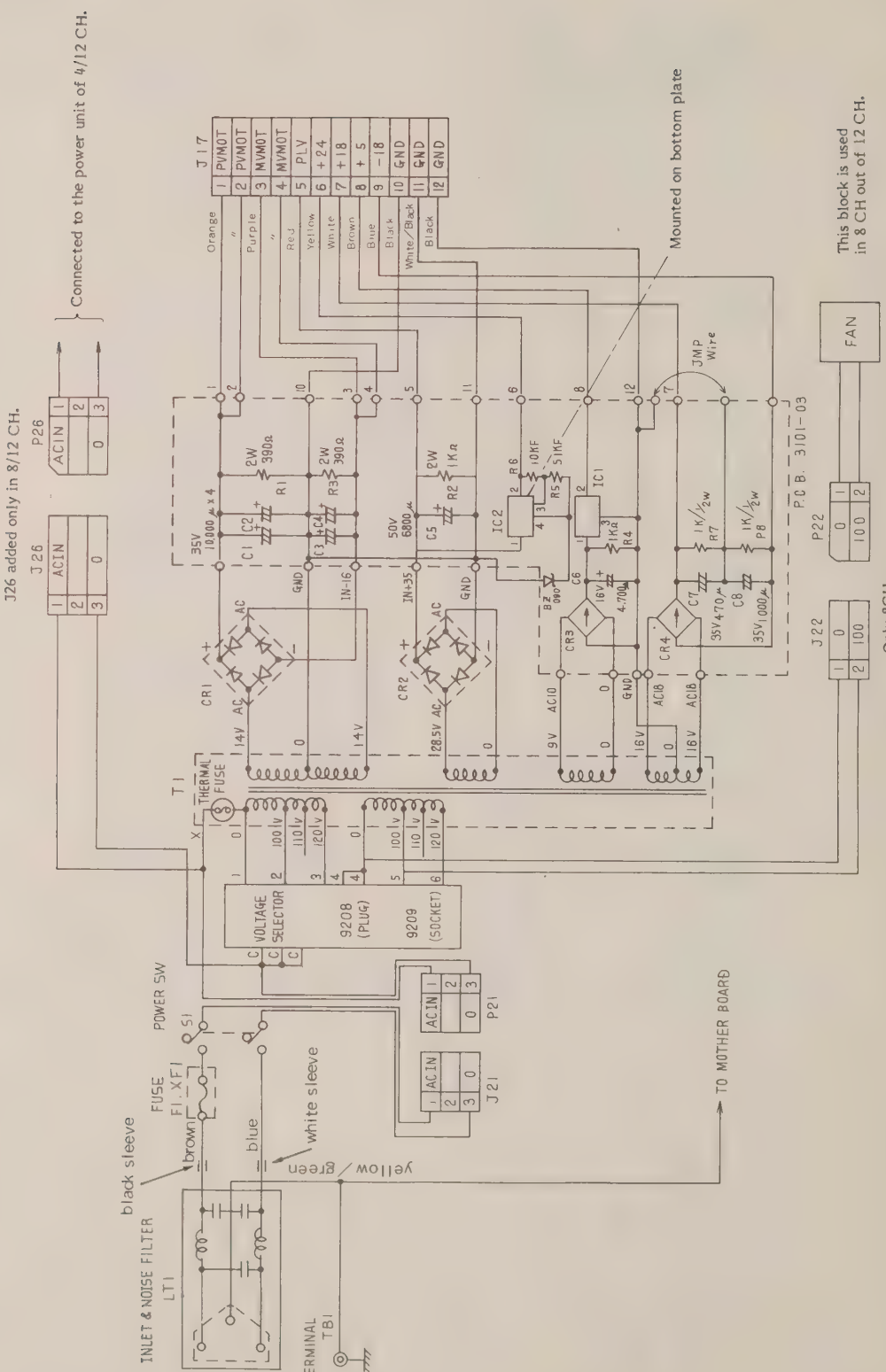
## Power Unit (2 CH)

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| R2 | 501606712 | R, Metal Film 1K 2W ±5% | RSF2B-1KJ | |
| R4 | 501203716 | R, Solid 1K 1/4W ±5% | RC1/4-1KJ | |
| R5 | 501303563 | R, Metal Film 5.1K 1/4W ±1% | RNE1/4-5.1KF | |
| R6 | 501303504 | R, " 10K 1/4W ±1% | RNE1/4-10KF | |
| C5 | 502102021 | C, Electrolytic 6800μ 50WV | ECET50R682 SW | |
| C6 | 502102017 | C, " 4700μ 16WV | ECEAICS472 | |
| CR1 | 503103010 | Diode Bridge | KBL02 | |
| CR2 | " | " | KBL02 | |
| CR3 | 503100022 | Diode Bridge AC140V 1.5A | WO2M | |
| CR4 | " | " " " | WO2M | |
| CR5 | 503100011 | Di, Zener 9V 1W ±5% | BZ090 | |
| IC1 | 503300128 | IC, Voltage Regulator 5V | UPC7805H | |
| IC2 | 503300129 | IC, " | UA78HGSC | |
| J17 | 513201202 | Connector, Receptacle 12P | 1625-12R-1 | |
| CNP | 513400002 | Contact Pin | 1855 TL | x 10, For J17 |
| J26 | 513200203 | Connector, Receptacle 2P | 1625-2R-1 | |
| CNP | 513400002 | Contact Pin | 1855TL | x 2, For J26 |
| T1 | 510310010 | Transformer | WR3101-2CH | |
| P21 | 513200301 | Connector, Plug 3P | 1625-3P-1 | |
| CNP | 513400021 | Contact Pin | 1560TL | x 2, For P21 |
| PCB | 511310140 | Printed Circuit Board | 3101-14B | POWER BOARD |

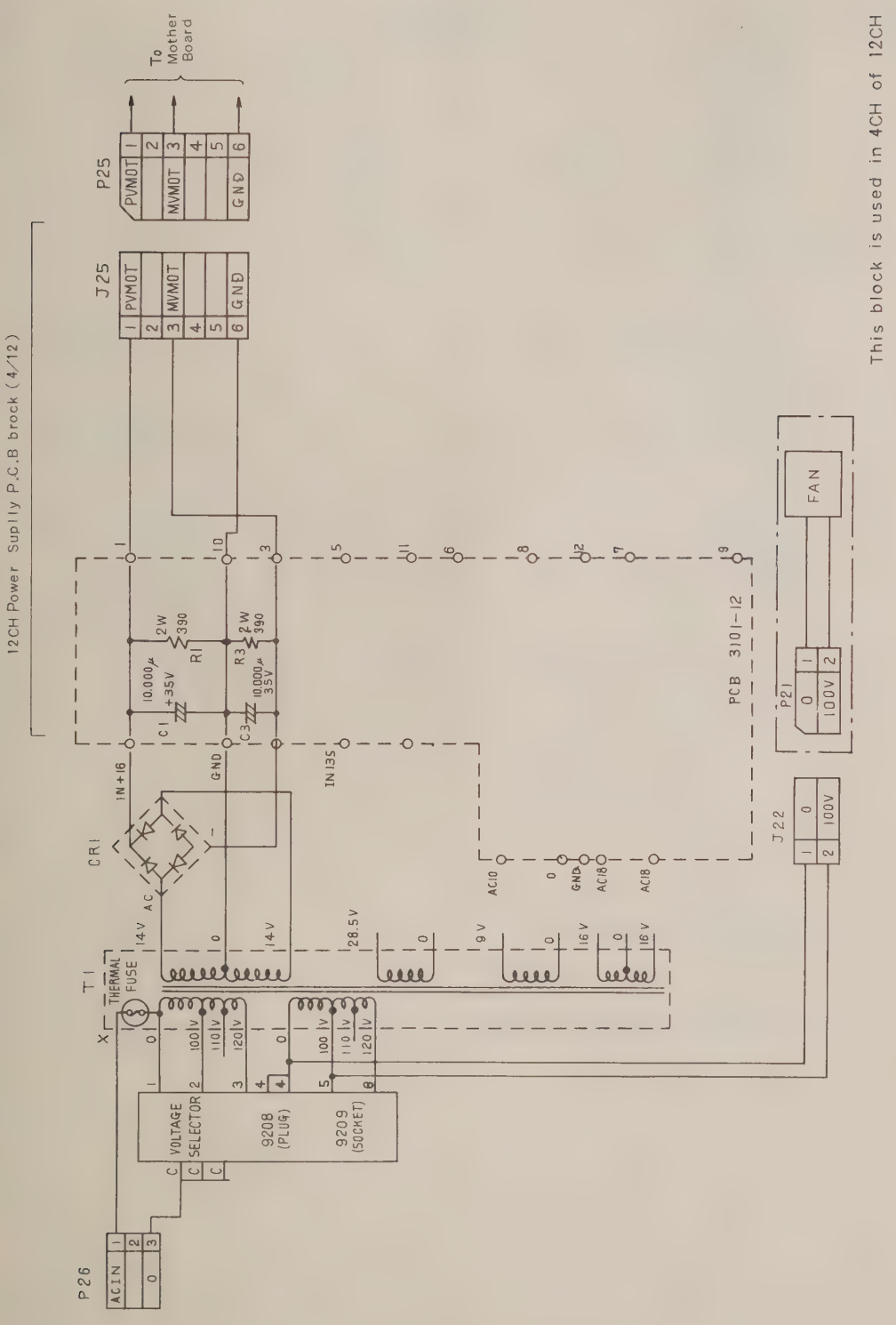
## Power Unit (4 CH)



## Power Unit (6 CH, 8 CH, 8/12 CH)



## Power Unit ( 4/12 CH)



## Power Unit (4 CH, 6 CH, 8 CH)

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | 501607611 | R, Metal Film | 390 | 1/2W | ±5% | RSF2B-390J | |
| R2 | 501606712 | R, " | 1K | 1/2W | ±5% | RSF2B-1KJ | |
| R3 | 501606711 | R, " | 390 | 1/2W | ±5% | RSF2B-390J | |
| R4 | G501203716 | R, Solid | 1K | 1/4W | ±5% | RC1/4-1KJ | |
| R5 | 501303563 | R, Metal Film | 5.1K | 1/4W | ±1% | RNE1/4-5.1KF | |
| R6 | G501303524 | R, " | 10K | 1/4W | ±1% | RNE1/4-10KF | |
| R7 | 501204719 | R, Solid | 1K | 1/2W | ±5% | RC1/2-1KJ | |
| R8 | 501204719 | R, " | 1K | " | " | RC1/2-1KJ | |
| C1 | 502102018 | C, Electrolytic | 10000μ | 35WV | | ECET35R103SW | |
| C2 | 502102018 | C, " | " | " | | ECET35R103SW | For 6 CH, 8 CH |
| C3 | 502102018 | C, " | " | " | | ECET35R103SW | |
| C4 | 502102018 | C, " | " | " | | ECET35R103SW | For 6 CH, 8 CH |
| C5 | 502102021 | C, " | 6800μ | 50WV | | ECET50R682SW | |
| C6 | 502102017 | C, " | 4700μ | 16WV | | ECEAICS472 | |
| C7 | 502503018 | C, " | 470μ | 35WV | | 35ULB470-M | |
| C8 | 502102019 | C, " | 1000μ | " | | ECEAIVS102 | |
| CR3 | G503100022 | Diode Bridge | AC140V | | 1.5A | W02M | |
| CR4 | G503100022 | " | " | | " | W02M | |
| CR5 | A503100011 | Di, Zener | 9V | 1W | ±5% | BZ090 | |
| PCB | 511310030 | Printed Circuit Board | | | | 3101-03C | For 6 CH, 8 CH |
| PCB | 513400002 | " | | | | 3101-12C | For 4 CH |
| J17 | G513201202 | Connector, Receptacle | | 12P· | | CN-1625-12R-1, | |
| CNP | G513400002 | Contact Pin | | | | 1855TL | x 12, For J17 |
| IC1 | 503300128 | IC, Voltage Regulator | | 5V | | UPC7805H | |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| CR1 | 503103013 | Diode Bridge | KBPC25-02 | |
| CR2 | 513103013 | " | KBPC25-02 | |
| | 513501001 | AC Selector Plug | 9208, | |
| | 513501002 | AC Selector Socket | 9209, | |
| J22 | 513200203 | Connector Receptacle 2P | CN, 1625-02R-1 | |
| CNP | G513400002 | Contact Pin | CNP, 1855TL | x 2, For J22 |
| P21 | G513200301 | Connector Plug 3P | CN-1625-2P-1 | |
| CNP | 513400021 | Contact Pin | CNP, 1560TL | x 2, For P21 |
| IC2 | 503300129 | IC, Voltage Regulator | UA78HGSC | |
| T1 | 510310030 | Transformer | WR3101-8CH | For 6 CH, 8 CH |
| T1 | 510310020 | " | WR3101-4CH | For 4 CH |

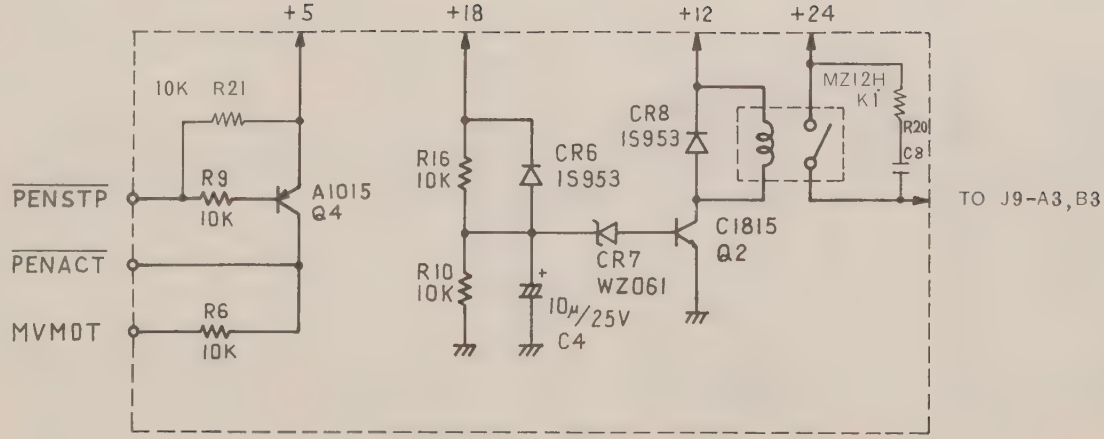
## Power Unit (12 CH – 4/12)

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| R1 | 501606711 | R, Metal Film 390 2W ±5% | RSF2B-390J | |
| R3 | " | R, " " " " | " | |
| C1 | 502102018 | C, Electrolytic 10000μ 35WV | ECET35R103SW | |
| C3 | " | C, " " " | " | |
| J25 | 513200602 | Connector, Receptacle 6P | 1625-6R-1 | |
| CNP | 513400002 | Contact Pin | 1855TL | x 3, For J25 |
| PCB | 513400002 | Printed Circuit Board | 3101-12C | |
| CR1 | 503103013 | Diode Bridge | KBPC25-02 | |
| T1 | 510310020 | Transformer | WR3101-4CH | |
| | 513501001 | AC Selector, Plug | 9208, | |
| | 513501002 | AC Selector, Socket | 9209. | |
| J22 | 513200203 | Connector, Receptacle 2P | 1625-02R-1 | |
| CNP | 513400002 | Contact Pin | 1855TL | x 2, For J22 |
| P26 | 513200301 | Connector, Plug 3P | 1625-3P-1 | |
| CNP | 513400021 | Contact Pin | 1560TL | x 2, For P26 |

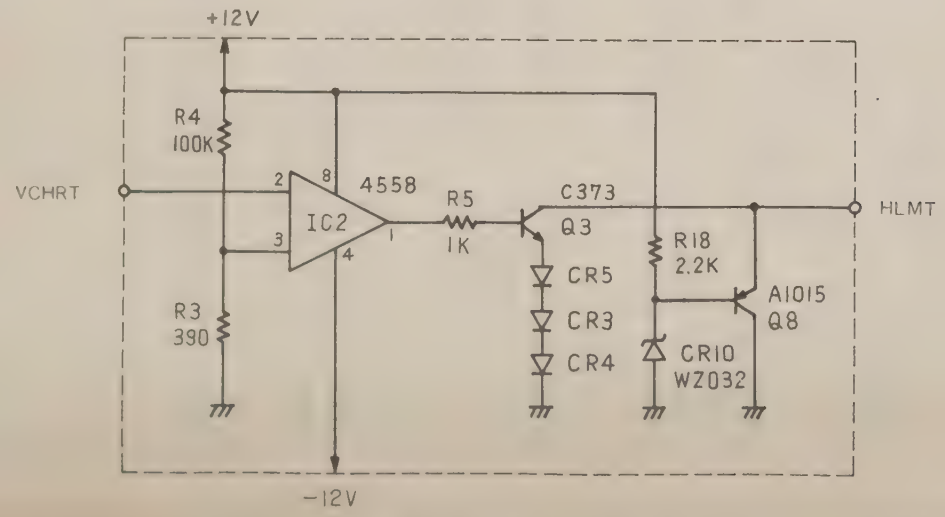
## Power Unit (12 CH – 8/12)

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | 501606711 | R, Metal Film | 390 | 1/2W | ±5% | RSF2B-390J | |
| R2 | 501606712 | R, " | 1K | 1/2W | ±5% | RSF2B-1KJ | |
| R3 | 501606711 | R, " | 390 | 1/2W | ±5% | RSF2B-390J | |
| R4 | G501203716 | R, Solid | 1K | 1/4W | ±5% | RC1/4-1KJ | |
| R5 | 501303563 | R, Metal Film | 5.1K | 1/4W | ±1% | RNE1/4-5.1KF | |
| R6 | G501303504 | R, " | 10K | 1/4W | ±1% | RNE1/4-10KF | |
| R7 | 501204719 | R, Solid | 1K | 1/2W | ±5% | RC1/2-1KJ | |
| R8 | 501204719 | R, " | 1K | " | " | RC1/2-1KJ | |
| C1 | 502102018 | C, Electrolytic | 10000μ | 35WV | | ECET35R103SW | |
| C2 | 502102018 | C, " | " | " | | ECET35R103SW | For 6 CH, 8 CH |
| C3 | 502102018 | C, " | " | " | | ECET35R103SW | |
| C4 | 502102018 | C, " | " | " | | ECET35R103SW | For 6 CH, 8 CH |
| C5 | 502102021 | C, " | 6800μ | 50WV | | ECET50R682SW | |
| C6 | 502102017 | C, " | 4700μ | 16WV | | ECEAICS472 | |
| C7 | 502503018 | C, " | 470μ | 35WV | | 35ULB470-M | |
| C8 | 502102019 | C, " | 1000μ | " | | ECEAIVS102 | |
| CR1 | 513103013 | Diode Bridge | | | | KBPC25-02 | |
| CR2 | " | " | | | | " | |
| CR3 | G503100022 | Diode Bridge | AC140V | | 1.5A | WO2M | |
| CR5 | A503100011 | Di, Zener | 9V | 1W | ±5% | BZ090 | |
| PCB | 511310030 | Printed Circuit Board | | | | 3101-03C | |
| J17 | G513201202 | Connector, Receptacle | | 12P | | CN-1625-12R-1 | |
| CNP | G513400002 | Contact Pin | | | | 1855TL | x 12, For J17 |
| IC1 | 503300128 | IC, Voltage Regulator 5V | | | | UPC7805H | |
| IC2 | 503300129 | IC, " | | | | UA78HGSC | |
| | 513501001 | AC Selector, Plug | | | | 9208, | |
| | 513501002 | AC Selector, Socket | | | | 9209, | |
| T1 | 510310030 | Transformer | | | | WR3101-8CH | |
| P21 | 513200301 | Connector, Plug | | 3P | | 1625-3P-1 | |
| CNP | 513400021 | Contact Pin | | | | 1560TL | x 2, For P21 |
| J26 | 513200302 | Connector, Receptacle | | 3P | | 1625-3R | |
| CNP | 513400022 | Contact Pin | | | | 1561TL | x 2, For J26 |

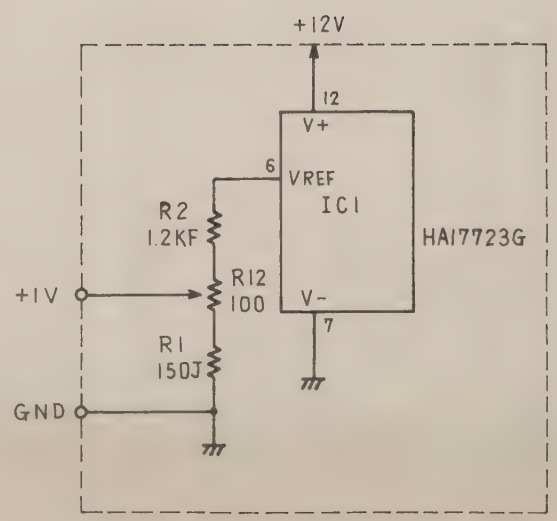
Circuit (A)




Circuit (B)




Circuit (C)

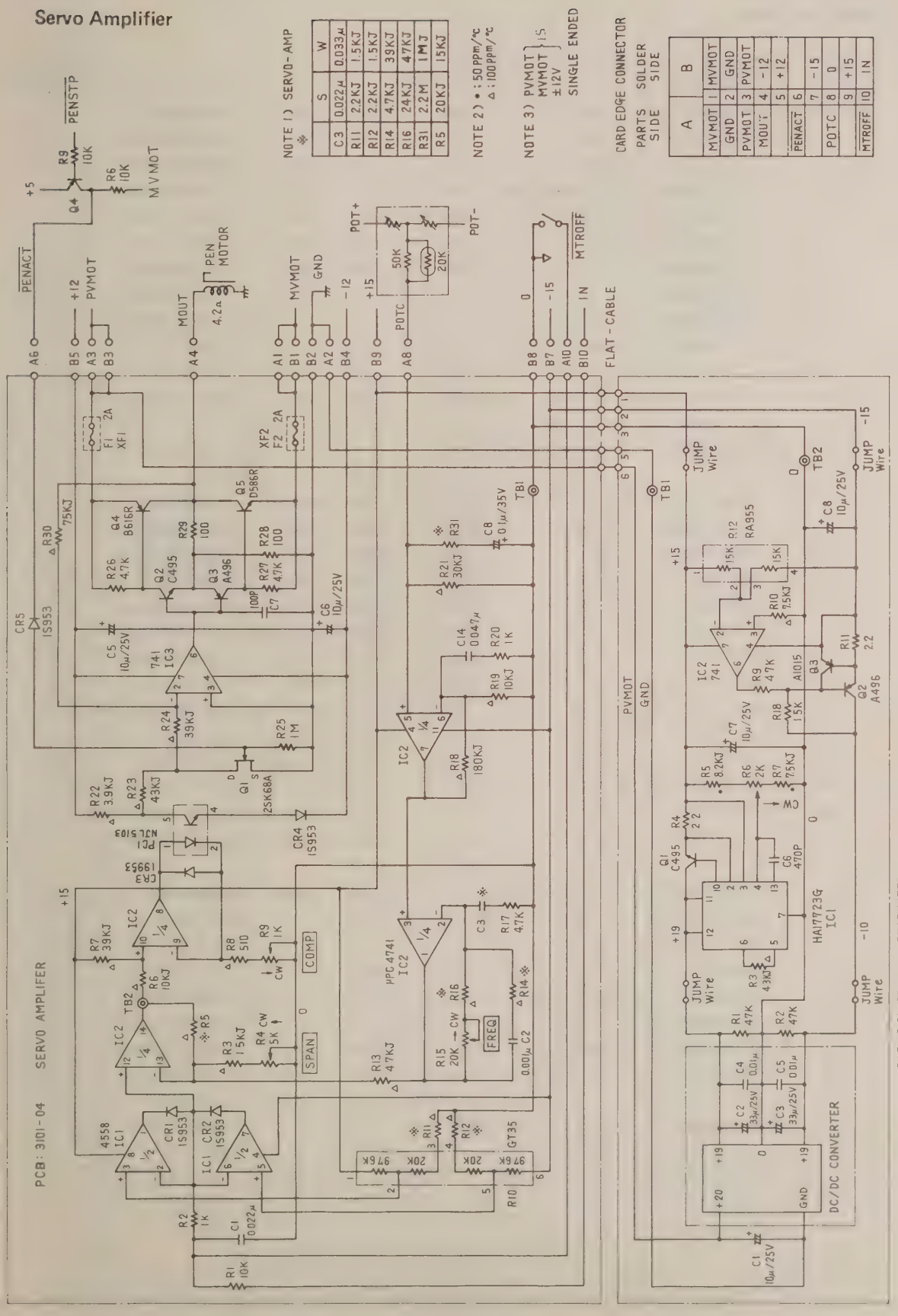


## Mother Board

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| R1 | 501443721 | R, Metal Film 150 1/4W ±5% | RP42C-150J | |
| R2 | G501443503 | R, " 1.2K 1/4W ±1% | RP42C-1.2KF | |
| R3 | 501303719 | R, " 390 1/4W ±5% | RNE1/4-390J | |
| R4 | 501303771 | R, " 100K 1/4W ±5% | RNE1/4-100KJ | |
| R5 | G501203716 | R, Solid 1K 1/4W ±5% | RC1/4-1KJ | |
| R6 | 501203725 | R, " 10K 1/4W ±5% | RC1/4-10KJ | |
| R7 | 501105707 | R, Carbon 330 1W ±5% | ERG1ANJ331 | For 2, 4 CH |
| R8 | " | R, " " " " | " | |
| R9 | 501203725 | R, Solid 10K 1/4W ±5% | RC1/4-10KJ | |
| R10 | 501203725 | R, " " " " | RC1/4-10KJ | |
| R12 | G501203721 | R, Trimmer Cermet 100 | RJ6P-100 | |
| R16 | 501203725 | R, Solid 10K 1/4W ±5% | RC1/4-10KJ | |
| R18 | 501203719 | R, " 2.2K " " | RC1/4-2.2KJ | |
| R13′ | 501204701 | R, Solid 4.7K 1/4W ±5% | RC1/4-4.7KJ | For 2CH |
| R14′ | " | R, " " " " | " | " |
| R15′ | 501606711 | R, Metal Film 390 2W ±5% | RSF2B-390J | " |
| R16′ | " | R, " " " " " | " | " |
| R20 | 501203707 | R, Solid 220 1/4W ±5% | RC1/4-220J | |
| R21 | 501203725 | R, " 10K 1/4W ±5% | RC1/4-10KJ | |
| C4′ | 502102015 | C, Electrolytic 6800μ 35WV | ECET35R682SW | For 2CH |
| C5′ | " | C, " 6800μ " | " | " |
| C6′ | 502102016 | C, " 470μ 35WV | ECEA1VS471 | For 2CH |
| C7′ | " | C, " " | " | " |
| C1-X | 502601003 | C, Oil 0.047μ 630WV | PMA-2J-473 | x CH |
| C2 | 502103023 | C, Electrolytic 10μ 25WV | SM25VB-10 | |
| C3 | " | C, " " " | " | |
| C4 | " | C, " " " | " | |
| C8 | 502303005 | C, Metal Film 0.047μ 50WV | MFL-05S47 | |
| CR1 | 503100021 | Di, Si $V_R$ = 200V $I_F$ = 1.1A | V06C | |
| CR2 | " | Di, " " " | " | |
| CR3 | 503100020 | Di, " $V_R$ = 30V $I_F$ = 0.1A | IS953 | |
| CR4 | " | Di, Si " " | " | |
| CR5 | " | Di, " " " | " | |
| CR6 | " | Di, " " " | " | |
| CR7 | 503100001 | Di, Zener 6.1V 0.5W ±5% | WZ061 | |
| CR8 | 503100020 | Di, Si $V_R$ = 30V $I_F$ = 0.1A | IS953 | |
| CR10 | 503100052 | Di, Zener 3.2V 0.5W ±5% | WZ032 | |
| IC1 | 503300117 | IC, Voltage Regulator | HA17723G | |
| IC2 | 503300054 | IC, Op-Amp Dual | NJM4558D | |
| IC3 | 503300115 | IC, Voltage Regulator | UPC7912H | |
| IC4 | 503300116 | IC, " " | UPC7812H | |
| Q2 | 503103014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | 2SC373 |
| Q3 | " | T, " " " " | " | " |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| Q4 | 503203016 | T, PNP −30V −100mA 200mV | 2SA1015, Y | 2SA495 |
| Q8 | " | T, " " " " | " | " |
| J8-X | 513300604 | Connector 10P x 2 | 225J21021-487 | x CH |
| J9-X | " | " " | " | x CH |
| J10-X | " | " " | " | x CH |
| P11 | 513400040 | " , Pin Holder 10P | HNC2-2.5P10DS | |
| P12 | 513400039 | " " 3P | HNC2-2.5P3DS | |
| P13 | " | " " 3P | " | |
| P14 | 513400038 | " " 2P | HNC2-2.5P2DS | |
| P17 | 513201201 | " , Plug 12P | 1625-12P-1 | |
| CNP | 513400001 | Contact Pin | 1854TL | x 12, For P17 |
| P26 | 513200202 | Connector, Plug 2P | 1625-2P-1 | X2 For P26 } For 2 CH |
| CNP | 513400001 | Contact Pin | 1854TL | |
| K1 | 515100004 | Relay DC12V 360Ω | MZ12H | |
| PCB | 511310180 | Printed Circuit Board | 3101-18A | For 2 CH |
| PCB | 511310150 | " | 3101-15A | For 4 CH |
| PCB | 511310190 | " | 3101-19 | For 6 CH |
| PCB | 511310010 | " | 3101-01B | For 8 CH |
| BB1 | 514200309 | Bus Bar 135mm, with Tube | T115-45-135I | For 4 CH, 12 CH |
| BB2 | " | " " " | " | |
| BB3 | 514200310 | " " " | T115-45-135 | |
| BB1 | 514200313 | Bus Bar 225mm with Tube | T115-45-225I | For 6 CH |
| BB2 | " | " " " | " | |
| BB3 | 514200314 | " " " | T115-45-225 | |
| BB1 | 514200311 | Bus Bar 315mm, with Tube | T115-45-315I | For 8 CH, 12 CH |
| BB2 | " | " " " | " | |
| BB3 | 514200312 | " " | T115-45-315 | |
| BB1 | 514200307 | Bus Bar 45mm, with Tube | T115-45-45I | For 2 CH |
| BB2 | " | " " " | " | |
| BB3 | 514200308 | " " | T115-45-45 | |
| PCB | 511310160 | Printed Circuit Board | 3101-16A | For 12 CH |
| PCB | 511310170 | " | 3101-17A | |
| P25 | 513200601 | Connector, Plug 6P | 1625-6P-1 | x 3 For 12 CH |
| CNP | 513400001 | Contact Pin | 1854TL | |

## Servo Amplifier



## Servo Amplifier

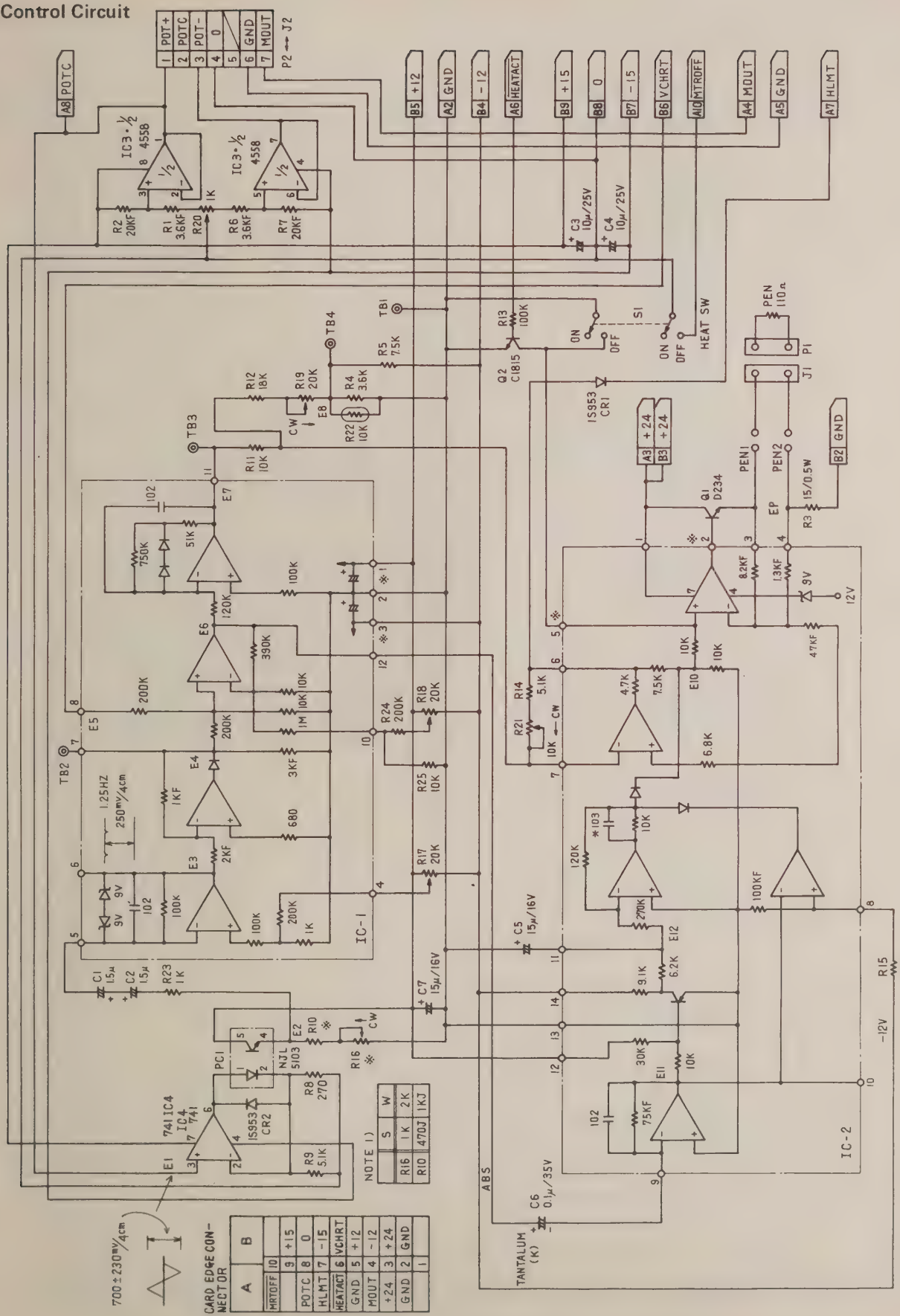
| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| R1 | G501263725 | R, Solid | 10K | 1/4W ±5% | RC1/4-10KJ | |
| R2 | G501203716 | R, Solid | 1K | 1/4W ±5% | RC1/4-1KJ | |
| R3 | G501303750 | R, Metal Film | 1.5K | 1/4W ±5% | RNE1/4-1.5KJ | |
| R4 | 504207048 | R, Trimmer Cermet | 5K | | TM10KPH-5K | |
| R5 | B501303770 | R, Metal Film | 20K | 1/4W ±5% | RNE1/4-20KJ | |
| R6 | G501303708 | R, " | 10K | 1/4W ±5% | RNE1/4-10KJ | |
| R7 | 501303793 | R, " | 39K | 1/4W ±5% | RNE1/4-39KJ | |
| R8 | G501303731 | R, " | 510 | 1/4W ±5% | RNE1/4-510J | |
| R9 | 504207049 | R, Trimmer Cermet | 1K | | TM10KPH-1K | |
| R10 | A501003311 | Resistor Array | (20K x 2) + (97.6K x 2) | | TG35 | |
| R13 | G501303733 | R, " | 4.7K | 1/4W ±5% | RNE1/4-4.7KJ | |
| R15 | G504207031 | R, Trimmer Cermet | 20K | | TM10KPH-20K | |
| R17 | G501203722 | R, Solid | 4.7K | 1/4W ±5% | RC1/4-4.7KJ | |
| R18 | 501303781 | R, Metal Film | 180K | 1/4W ±5% | RNE1/4-180KJ | |
| R19 | G501303708 | R, " | 10K | 1/4W ±5% | RNE1/4-10KJ | |
| R20 | G501203716 | R, Solid | 1K | 1/4W ±5% | RC1/4-1KJ | |
| R21 | G501303718 | R, Metal Film | 30K | 1/4W ±5% | RNE1/4-30KJ | |
| R22 | G501303729 | R, " | 3.9K | 1/4W ±5% | RNE1/4-3.7KJ | |
| R23 | G501303768 | R, " | 43K | 1/4W ±5% | RNE1/4-43KJ | |
| R24 | 501303793 | R, " | 39K | 1/4W ±5% | RNE1/4-39KJ | |
| R25 | G501203738 | R, Solid | 1M | 1/4W ±5% | RC1/4-1MJ | |
| R26 | G501203722 | R, " | 4.7K | 1/4W ±5% | RC1/4-4.7KJ | |
| R27 | G501203722 | R, " | " | " " | RC1/4-4.7KJ | |
| R28 | G501203707 | R, " | 100 | 1/4W ±5% | RC1/4-100 J | |
| R29 | G501203707 | R, " | " | " " | RC1/4-100 J | |
| R30 | G501303757 | R, Metal Film | 100 | 1/4W ±5% | RNE1/4-7.5KJ | |
| C1 | G502303008 | C, Myler Film | 0.022μ | 50WV | MFL-05S22 | |
| C2 | G502303002 | C, " | 0.001μ | 50WV | MFL-05DI | |
| C4 | G502303005 | C, " | 0.047μ | 50WV | MFL-05S47 | |
| C5 | 502103023 | C, Electrolytic | 10μ | 25WV | SM25VB-10 | |
| C6 | 502103023 | C, " | " | " | SM25VB-10 | |
| C7 | G502403009 | C, Ceramic | 100P | 50WV | UFD04-101K-K2J | |
| C8 | G502203012 | C, Tantalum | 0.1μ | 35WV | CS15EIV0R1M | |
| CR1 | G503100020 | Di, Si | $V_R$ = 30V | $I_F$ = 0.1A | IS953 | |
| CR2 | G503100020 | Di, Si | " | " | IS953 | |
| CR3 | G503100026 | Di, " | " | " | IS953 | |
| CR4 | G503100020 | Di " | " | " | IS953 | |
| CR5 | G503100020 | Di, " | " | " | IS953 | |

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| IC1 | G503300054 | IC, Op-Amp | Dual | | | NJM4558D | |
| IC2 | A503300034 | IC, " | Quad | | | UPC474IC | |
| IC3 | A503300025 | IC, Op-Amp | | | | NJM741D | TA7504P |
| PC1 | A503300108 | Photo Coupler | $I_F$ = 70mA, $I_C$ = 100mA 60% ≤ CTR ≤ 150% | | | NJL5103D | |
| Q1 | 503203015 | T, N-J-FET | | | | 2SK68A | |
| Q2 | G503200011 | T, NPN | 50V | 1A | 1W | 2SC495, O | |
| Q3 | G503200010 | T, PNP | –50V | –1A | 1W | 2SA496, O | |
| Q4 | G503200018 | T, PNP | –80V | –5A | 60W | 2SB616, R | |
| Q5 | G503200021 | T, NPN | 80V | 5A | 60W | 2SD586, R | |
| TB1 | B513400027 | Test Terminal | | | | LC-1-G | |
| TB2 | B513400027 | " | | | | LC-1-G | |
| FX1 | 512400008 | Fuse Holder | | | | OG751-0056 | |
| FX1' | 512400008 | " | | | | OG751-0056 | |
| FX2 | 512400008 | " | | | | OG751-0056 | |
| FX2' | 512400008 | " | | | | OG751-0056 | |
| F1 | 512300011 | Fuse | 2A | | | 7142-2A, | |
| F2 | 512300011 | " | 2A | | | 7142-2A | |
| FC | 520110061 | Flat Cable | 6 Pin | | | JVU–,1-35-3P254 | |
| PCB | 511310040 | Printed Circuit Board | | | | 3101-04B | |
| | 520100030 | Insulating Washer | | | | B-18 | x 4 |
| | 003317130 | Insulating Sheet | | | | | x 2 |
| R11 | 501303766 | R, Metal Film | 2.2K | 1/4W | ±5% | RNE1/4-2.2KJ | For Type S |
| " | 501303750 | R, " | 1.5K | " | " | RNE1/4-1.5KJ | " W |
| R12 | 501303766 | R, " | 2.2K | " | " | RNE1/4-2.2KJ | " S |
| " | 501303750 | R, " | 1.5K | " | " | RNE1/4-1.5KJ | " W |
| R14 | 501303733 | R, " | 4.7K | " | " | RNE1/4-4.7KJ | " S |
| " | 501303793 | R, " | 39K | " | " | RNE1/4-39KJ | " W |
| R16 | 501303732 | R, " | 24K | " | " | RNE1/4-24KJ | " S |
| " | 501303741 | R, " | 47K | " | " | RNE1/4-47KJ | " W |
| R31 | 501203740 | R, Solid | 2.2M | " | " | RC1/4-2.2MJ | " S |
| " | 501203738 | R, " | 1M | " | " | RC1/4-1MJ | " W |
| C3 | 502303008 | C, Myler Film | 0.022μ | 50WV | | MFL-05S22 | For Type S |
| " | 502303009 | C, " | 0.033μ | 50WV | | MFL-05-S33 | " W |

## Stabilizer

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | 501203751 | R, Solid | 47K | 1/4W | ±5% | RC1/4-47KJ | |
| R2 | " | R, " | " | " | " | " | |
| R3 | 501303745 | R, Metal Film | 4.3K | 1/4W | ±5% | RNE1/4-4.3KJ | |
| R4 | 501203701 | R, Solid | 2.2 | 1/4W | ±5% | RC1/4-2.2J | |
| R5 | 501443719 | R, Metal Film | 8.2K | 1/4W | ±5% | RP42C8.2KJ | |
| R6 | 505103009 | R, Trimmer Cermet | 2K | | | RJ6X-2K | |
| R7 | 501442720 | R, Metal Film | 7.5K | 1/4W | ±5% | RP42C7.5KJ | |
| R8 | 501203718 | R, Solid | 1.5K | 1/4W | ±5% | RC1/4-1.5KJ | |
| R9 | 501203722 | R, " | 4.7K | 1/4W | ±5% | RC1/4-4.7KJ | |
| R10 | 501303720 | R, Metal Film | 7.5K | 1/4W | ±5% | RNE1/4-7.5KJ | |
| R11 | 501203701 | R, Solid | 2.2 | 1/4W | ±5% | RC1/4-2.2J | |
| R12 | 501003313 | Resistor Array | 15K x 2 | | | RA955 | |
| C1 | 502103023 | C, Electrolytic | 10μ | 25WV | | SM25VB-10 | |
| C2 | 502103011 | C, " | 33μ | 25WV | | SL25VB-33 | |
| C3 | " | C, " | " | " | | " | |
| C4 | 502403007 | C, Ceramic | 0.01μ | 50WV | | ULD06-103-L2A | |
| C5 | " | C, " | " | " | | " | |
| C6 | 502403003 | C, " | 470P | " | | USD04-SL-471K | |
| C7 | 502103023 | C, Electrolytic | 10μ | 25WV | | SM25VB-10 | |
| C8 | " | C, " | " | " | | " | |
| IC1 | 503300117 | IC, Voltage Regulator | | | | HA17723G | |
| IC2 | 503300025 | IC, Op-Amp | | | | TA7504P | NJM741D |
| Q1 | 503200011 | T, NPN | 50V | 1A | 1W | 2SC495, 0 | |
| Q2 | 503200010 | T, PNP | –50V | 1A | 1W | 2SA496, 0 | |
| Q3 | 503200002 | T, PNP | –30V | –100mA | 200mW | 2SA1015, Y | 2SA495 |
| TB1 | 513400027 | Test Terminal | | | | LC-1-G | |
| TB2 | " | " | | | | " | |
| Con V | 518100004 | DC/DC Converter | | | | CE-0134 | |
| PCB | 511310050 | Printed Circuit Board | | | | 3101-05B | |

## Heat Control Circuit

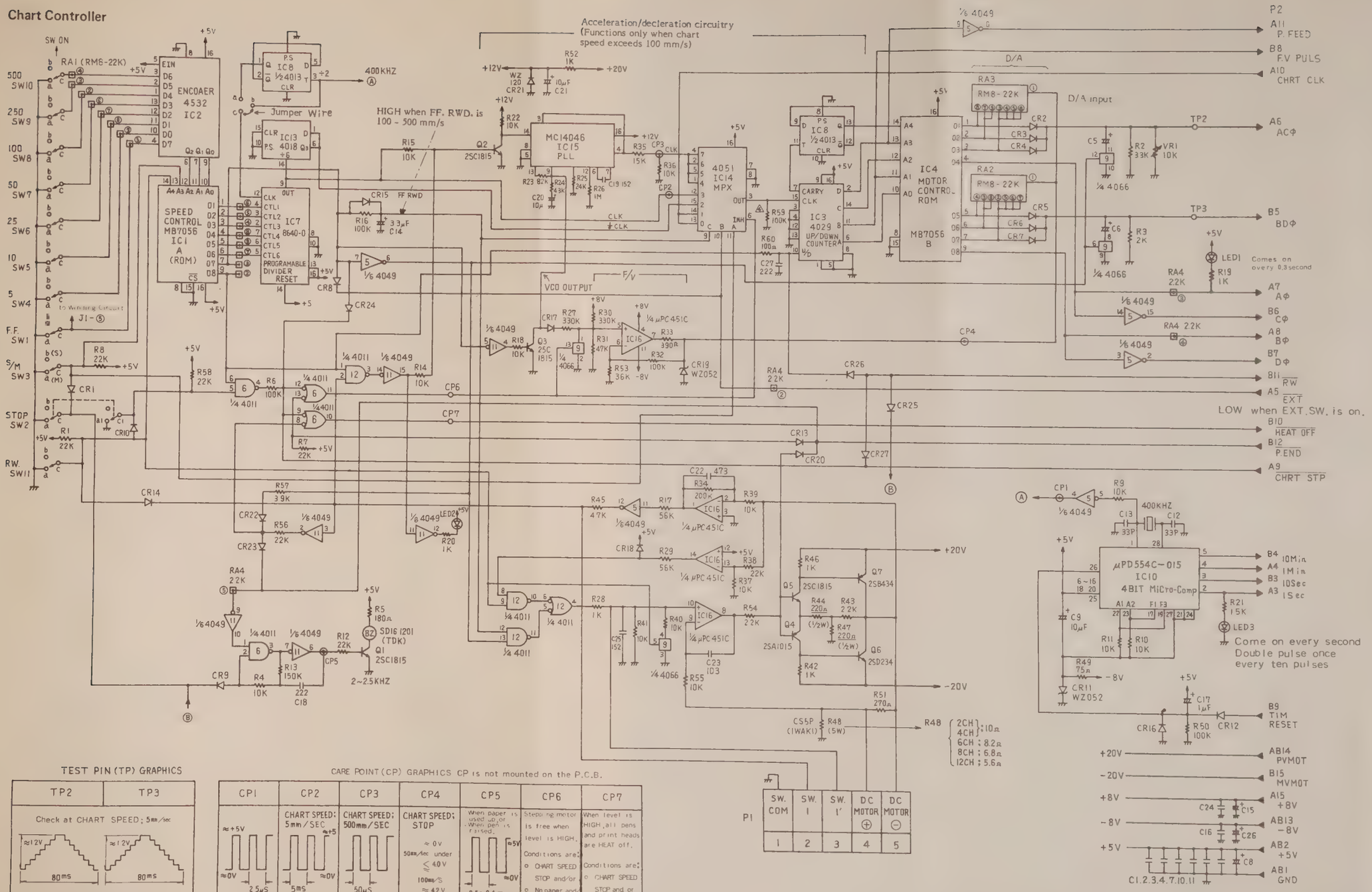


## Heat Control Circuit

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | 501303565 | R, Metal Film | 3.6K | 1/4W | ±1% | RNE1/4-3.6KF | |
| R2 | G501303518 | R, " | 20K | 1/4W | ±1% | RNE1/4-20KF | |
| R3 | G501304701 | R, " | 15 | 1/2W | ±5% | RNE1/2-15J | |
| R4 | G501303764 | R, " | 3.6K | 1/4W | ±5% | RNE1/4-3.6KJ | |
| R5 | G501303720 | R, " | 7.5K | 1/4W | ±5% | RNE1/4-7.5KJ | |
| R6 | G501303764 | R, " | 3.6K | 1/4W | ±1% | RNE1/4-3.6KF | |
| R7 | G501303518 | R, " | 20K | 1/4W | ±1% | RNE1/4-20KF, | |
| R8 | 501303794 | R, " | 270 | 1/4W | ±5% | RNE1/4-270J | |
| R9 | G501303758 | R, " | 5.1K | 1/4W | ±5% | RNE1/4-5.1KJ | |
| R11 | G501303708 | R, " | 10K | 1/4W | ±5% | RNE1/4-10KJ | |
| R12 | G501303746 | R, " | 18K | 1/4W | ±5% | RNE1/4-18KJ | |
| R13 | G501203731 | R, Solid | 100K | 1/4W | ±5% | RC1/4-100KJ | |
| R14 | G501303758 | R, Metal Film | 5.1K | 1/4W | ±5% | RNE1/4-5.1KJ | |
| R15 | 501303566 | R, " | 33K | 1/4W | ±1% | RNE1/4-33KF | |
| R17 | G504207031 | R, Trimmer | 20K | | | TM10KPH-20K | |
| R18 | G504207031 | R, " | 20K | | | TM10KPH-20K | " |
| R19 | A505103023 | R, Trimmer Cermet | 20K | | | RJ6X-20K | |
| R20 | G505103011 | R, " " | 1K | | | RJ6X-1K | |
| R21 | 504103021 | R, Variable Carbon | 10K | | | RV16YP20SB10K | |
| R22 | B503400005 | R, Thermister | 10K | | | 10KD7-15% | |
| R23 | 501203716 | R, Solid | 1K | 1/4W | ±5% | RC1/4-1KJ | |
| R24 | G501303760 | R, Metal Film | 200K | 1/4W | ±5% | RNE1/4-200KJ | |
| R25 | G501303708 | R, " | 10K | 1/4W | ±5% | RNE1/4-10KJ | |
| C1 | A502203024 | C, Tantalum | 1.5μ | 16WV | | CS15EICIR5M | |
| C2 | A502203024 | C, " | " | " | | CS15EICIR5M | |
| C3 | 502103023 | C, Electrolytic | 10μ | 25WV | | SM25VB-10 | |
| C4 | 502103023 | C, " | " | " | | SM25VB-10 | |
| C5 | G502203014 | C, Tantalum | 15μ | 16WV | | CS15EIC150M | |
| C6 | 502101022 | C, " | 0.1μ | 35WV | | SSV350R1 | |
| C7 | 502103023 | C, Electrolytic | 10μ | 25WV | | SM25VB-10 | |
| CR1 | G503100020 | Di, Si | $V_R$ = 30V | $I_F$ = 0.1A | | IS953 | |
| CR2 | G503100020 | Di, " | " | " | | IS953 | |
| IC1 | 503300149 | Resistor Array | | | | GT85A | |
| IC2 | 503300150 | " | | | | GT86A | |
| IC3 | G503300054 | IC, Op-Amp | Dual | | | NJM4558D | |
| IC4 | G503300025 | IC, " | | | | TA7504P | NJM7410 |
| S1 | 508102013 | Switch, Toggle | | | | M-2022H | |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| TB1 | B513400027 | Test Terminal | LC-1-G | |
| TB2 | B513400027 | " | LC-1-G | |
| TB3 | B513400027 | " | LC-1-G | |
| PCB | 511310060 | Printed Circuit Board | 3101-06C | |
| PC1 | A503300108 | Photo Coupler $I_F$ = 70mA $I_C$ = 100mA 60% ≤ CTR ≤ 150% | NJL5103D | |
| Q1 | G503200015 | T, NPN 3A 60V 1.5W | 2SD234, O | |
| Q2 | 503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | 2SC373 |
| J1 | A513200201 | Connector, Socket 2P | S-I0320, | |
| P2 | 513400049 | Connector, Pin Header 7P | HNC2-2.5P.7DS | |
| J2 | 513400047 | Connector, Receptacle 7P | HNC2-2.5S7 | |
| CNP | 513400042 | Contact Pin | HNC-2.5S-B | x 6, For J2 |
| | B520100012 | Insulating sheet | 30B6001 | |
| | B520100013 | Insulating washer | AC316A | |
| R10 | 501303704 | R, Metal Film 470 1/4W ±5% | RNE1/4-470J | For Type S |
| " | 501303717 | R, " 1K " " | RNE1/4-1KJ | " W |
| R16 | 505103711 | R, Trimmer Cermet 1K | RJ6X-1K | " S |
| " | 504103009 | R, " 2K | RJ6X-2K | " W |

## Chart Controller




TEST PIN (TP) GRAPHICS

| TP2 | TP3 |
|---|---|
| Check at CHART SPEED; 5mm/sec | |
| ≈12V, 80ms | ≈12V, 80ms |
| Adjust VR1 so that the voltage of TP2 coincides with that of TP3. | |

CARE POINT (CP) GRAPHICS CP is not mounted on the P.C.B.

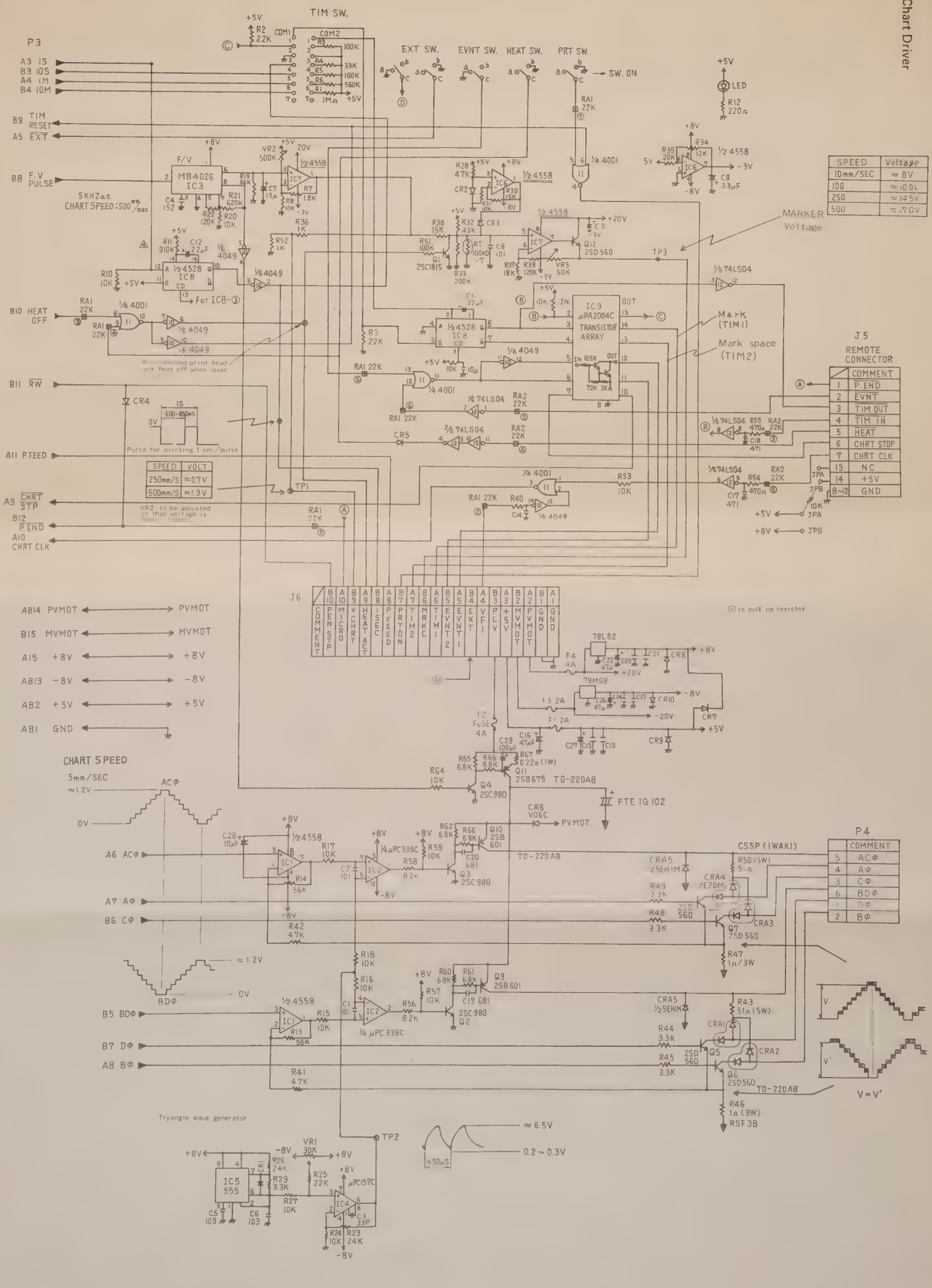
| CP1 | CP2 | CP3 | CP4 | CP5 | CP6 | CP7 |
|---|---|---|---|---|---|---|
| ≈+5V, ≈0V, 2.5μS, 400KHZ | CHART SPEED: 5mm/SEC, ≈+5, ≈0V, 5mS | CHART SPEED: 500mm/SEC, 50μS | CHART SPEED: STOP; ≈0V; 50mm/sec under ≦4.0V; 100mm/S ≈4.2V; 250mm/S ≈4.8V | When paper is used up, or When pen is raised. ≈5V, ≈0V, 0.5~0.4m 2K~2.5KHz Check at CHART SPEED; STOP | Stepping motor is free when level is HIGH. Conditions are; ○ CHART SPEED STOP and/or ○ No paper and/or ○ PEN LIFT up. | When level is HIGH, all pens and print heads are HEAT off. Conditions are; ○ CHART SPEED STOP and or ○ No paper and or ○ PEN LIFT up. |

## Chart Controller

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| IC1 | A503300147 | IC, NMOS Bipolar Memory | MB7056 | |
| IC2 | A503300118 | IC, CMOS Encorder | TC4532BP | |
| IC3 | A503300107 | IC, CMOS Binary U/D Counter | TC4029BP | |
| IC4 | A503300148 | IC, NMOS Bipolar Memory | MB7056 | |
| IC5 | A503300094 | IC, CMOS Hex Inverting Buffer | TC4049BP | |
| IC6 | A503300062 | IC, CMOS Quad 2 In-Nand | TC4011BP | |
| IC7 | A503300100 | IC, CMOS Programable Divider | 8640-o | |
| IC8 | A503300064 | IC, CMOS Dual D Flip-Flop | TC4013BP | |
| IC9 | G503300052 | IC, CMOS Dual Bilateral Switch | TC4066BP | |
| IC10 | B503300049 | IC, PMOS Micro Computer | μPD554C-015 | |
| IC11 | A503300094 | IC, CMOS Hex Inverting Buffer | TC4049BP | |
| IC12 | A503300062 | IC, CMOS Quad 2 In-Nand | TC4011BP | |
| IC13 | A503300119 | IC, CMOS Divide-By-N Counter | TC4018BP | |
| IC14 | A503300113 | IC, CMOS 8-Ch, Multiplexer | TC4051BP | |
| IC15 | A503300120 | IC, CMOS Phase Locked Loop | MC14046 | |
| IC16 | A503300034 | IC, Op Amp Quad | μPC4741C | |
| Q1~3 | G503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | |
| Q4 | G503203016 | T, PNP –30V –100mA 200mW | 2SA1015, Y | |
| Q5 | G503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | |
| Q6 | G503200015 | T, NPN 60V 3A 1.5W | 2SD234, O | |
| Q7 | G503200007 | T, PNP –50V –3A 1.5W | 2SB434, O | |
| CR1~10 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR11 | A503100060 | Di, Zener 5.2V 0.5W ±5% | WZ052 | |
| CR12~18 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR19 | A503100060 | Di, Zener 5.2V 0.5W ±5% | WZ052 | |
| CR20 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR21 | G503100006 | Di, Zener 12.0V 0.5W ±5% | WZ120 | |
| CR22~27 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| LED1~3 | A502100017 | Di, LED Red $I_F$ = 25mA | TLR102 | |
| R1 | G501203727 | R, Solid 22K 1/4 ±5% | RC1/4-22KJ | |
| R2 | G501303774 | R, Metal Film 3.3K 1/4 ±5% | RNE1/4-3.3KJ | |
| R3 | G501303701 | R, Metal Film 2K 1/4 ±5% | RNE1/4-2KJ | |
| R4 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R5 | G501203770 | R, Solid 180 1/4 ±5% | RC1/4-180J | |
| R6 | G501203731 | R, Solid 100K 1/4 ±5% | RC1/4-100KJ | |
| R7 | G501203727 | R, Solid 22K 1/4 ±5% | RC1/4-22KJ | |
| R8 | G501203719 | R, Solid 2.2K 1/4 ±5% | RC1/4-2.2KJ | |
| R9~11 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R12 | G501203727 | R, Solid 22K 1/4 ±5% | RC1/4-22KJ | |
| R13 | G501203731 | R, Solid 100K 1/4 ±5% | RC1/4-100KJ | |
| R14, 15 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R16 | G501203731 | R, Solid | 100K | 1/4 | ±5% | RC1/4-100KJ | |
| R17 | G501203730 | R, Solid | 56K | 1/4 | ±5% | RC1/4-56KJ | |
| R18 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R19, 20 | G501203716 | R, Solid | 1K | 1/4 | ±5% | RC1/4-1KJ | |
| R21 | G501203718 | R, Solid | 1.5K | 1/4 | ±5% | RC1/4-1.5KJ | |
| R22 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R23 | 501203755 | R, Solid | 82K | 1/4 | ±5% | RC1/4-82KJ | |
| R24 | G501303745 | R, Metal Film | 4.3K | 1/4 | ±5% | RNE1/4-4.3KJ | |
| R25 | G501203772 | R, Solid | 24K | 1/4 | ±5% | RC1/4-24KJ | |
| R26 | G501203738 | R, Solid | 1M | 1/4 | ±5% | RC1/4-1MJ | |
| R27 | G501303775 | R, Metal Film | 330K | 1/4 | ±5% | RNE1/4-330KJ | |
| R28 | G501203716 | R, Solid | 1K | 1/4 | ±5% | RC1/4-1KJ | |
| R29 | G501203730 | R, Solid | 56K | 1/4 | ±5% | RC1/4-56KJ | |
| R30 | G501303775 | R, Metal Film | 330K | 1/4 | ±5% | RNE1/4-330KJ | |
| R31 | G501303741 | R, Metal Film | 47K | 1/4 | ±5% | RNE1/4-47KJ | |
| R32 | G501303705 | R, Metal Film | 100K | 1/4 | ±5% | RNE1/4-100KJ | |
| R33 | G501303719 | R, Metal Film | 390 | 1/4 | ±5% | RNE1/4-390J | |
| R34 | G501203771 | R, Solid | 200K | 1/4 | ±5% | RC1/4-200KJ | |
| R35 | G501203726 | R, Solid | 15K | 1/4 | ±5% | RC1/4-15KJ | |
| R36, 37 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R38 | G501203727 | R, Solid | 22K | 1/4 | ±5% | RC1/4-22KJ | |
| R39~41 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R42 | G501203716 | R, Solid | 1K | 1/4 | ±5% | RC1/4-1KJ | |
| R43 | G501203719 | R, Solid | 2.2K | 1/4 | ±5% | RC1/4-2.2KJ | |
| R44 | A501604703 | R, Metal Film | 220 | 1/2 | ±5% | RSF1/2-220J | |
| R45 | G501203722 | R, Solid | 4.7K | 1/4 | ±5% | RC1/4-4.7KJ | |
| R46 | G501203716 | R, Solid | 1K | 1/4 | ±5% | RC1/4-1KJ | |
| R47 | A501604703 | R, Metal Film | 220 | 1/2 | ±5% | RSF1/2-220J | |
| R48 | A501609728 | R, Wirewound | 10 | 5 | ±5% | CS5P-10J | For 2 CH, 4 CH |
| | A501609729 | | 8.2 | 5 | ±5% | CS5P-8.2J | For 6 CH |
| | A501609730 | | 6.8 | 5 | ±5% | CS5P-6.8J | For 8 CH |
| | A501609731 | | 5.6 | 5 | ±5% | CS5P-5.6J | For 12 CH |
| R49 | G501303792 | R, Metal Film | 75 | 1/4 | ±5% | RNE1/4-75J | |
| R50 | G501203731 | R, Solid | 100K | 1/4 | ±5% | RC1/4-100KJ | |
| R51 | G501203710 | R, Solid | 270 | 1/4 | ±5% | RC1/4-270J | |
| R52 | G501303717 | R, Metal Film | 1K | 1/4 | ±5% | RNE1/4-1KJ | |
| R53 | G501303722 | R, Metal Film | 36K | 1/4 | ±5% | RNE1/4-36KJ | |
| R54 | G501203719 | R, Solid | 2.2K | 1/4 | ±5% | RC1/4-2.2KJ | |
| R55 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R56 | G501203727 | R, Solid | 22K | 1/4 | ±5% | RC1/4-22KJ | |
| R57 | G501203760 | R, Solid | 3.9K | 1/4 | ±5% | RC1/4-3.9KJ | |
| R58 | G501203727 | R, Solid | 22K | 1/4 | ±5% | RC1/4-22KJ | |
| R59 | G501203731 | R, Solid | 100K | 1/4 | ±5% | RC1/4-100KJ | |
| R60 | G501203707 | R, Solid | 100 | 1/4 | ±5% | RC1/4-100J | |

| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| C1~4 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C5, 6 | G502203006 | C, Tantalum | 0.22μ | 35WV | CS15EIVR22M | |
| C7 | G502403007 | C, Ceramic | 0.01μ | 50WV | VLD06-103-L2A | |
| C8 | G502103025 | C, Electrolytic | 47μ | 10WV | SM10VB-47 | |
| C9 | G502203002 | C, Tantalum | 10μ | 15WV | CS15EIC100M | |
| C10, 11 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C12, 13 | G502403034 | C, Ceramic | 33P | 50WV | RAU04SL330KL05AE | |
| C14 | G502203003 | C, Tantalum | 3.3μ | 15WV | CS15EIC3R3M | |
| C15 | G502103024 | C, Electrolytic | 47μ | 16WV | SM16VB-47 | |
| C16 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C17 | G502203013 | C, Tantalum | 1μ | 35WV | CS15EIV010M | |
| C18 | G502303001 | C, Myler Film | 2200P | 50WV | MFL-05D22 | |
| C19 | G502303019 | C, Myler Film | 1500P | 50WV | MFL-05D15 | |
| C21 | G502203018 | C, Tantalum | 10μ | 25WV | CS15EIE100M | |
| C20 | G502203002 | C, Tantalum | 10μ | 15WV | CS15EIC100M | |
| C22 | G502303005 | C, Myler Film | 0.047μ | 50WV | MFL-05S47 | |
| C23 | G502303004 | C, Myler Film | 0.01μ | 50WV | MFL-05SI | |
| C24 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C25 | G502303019 | C, Myler Film | 1500P | 50WV | MFL-05D15 | |
| C26 | G502103024 | C, Electrolytic | 47μ | 16WV | SL16VB-47 | |
| C27 | G502403028 | C, Ceramic | 2200P | 50WV | ULD04SA222J-L2A | |
| RA1 | B501002810 | Resister Array | | ±10% | RKC1/8 B8 2.2KK | |
| RA2, 3 | B501002811 | Resister Array | | ±10% | RKC1/8 B8 23KK | |
| RA4 | B501002812 | Resister Array | | ±10% | RKC1/8 B4 2.2KK | |
| RA5 | B501002813 | Resister Array | | ±10% | RKC1/8 B8 10KK | |
| VR1 | G504207015 | R, Trimmer, Cermet | 10K | | TM10KPV10K | |
| TP1~3 | B513400027 | Check PIN | | | LC-1-G | |
| BZ | A519300001 | Buzzer | | | SD161201 | |
| X1 | A519105001 | X Crystal Osillator | 400KHz | | HC-6/UW-400KHz | |
| SW1 | A508201013 | Switch Push Non-Lock | | | KSD1-2-0NLDC | |
| SW2, 3 | A508213003 | Switch Push Lock | | | KSD2-4-10LLDC | |
| SW4~10 | A508207001 | Switch Push Lock | | | KSD7-14-10ILDC | |
| P1 | B513400045 | Connector, Pin Header | 5P | | HNC2-2.5P-5DSL | |
| P2 | A513301007 | Connector | 30 PIN | | PS30PAD4TIAI | |
| P27 | G513200101 | Connector, Plug | 1P | | 1625-1P-1 | |
| CNP | G513400001 | Contact Pin | | | 1854TL | |
| FCA | A520110060 | Flat Cable with Connector | | 30 PIN, 42mm | L42-30P | |
| PCB | A511310020 | Printed Circuit Board | | | 3101-02B | |
| | B516100020 | Cap, Black | | | B911 | x 10 |
| | A516100025 | Cap, Ivory | | | B201 | |
| | B508201007 | Spacer | | | IP-10 | x 11 |




| SPEED | Voltage |
|---|---|
| 10mm/SEC | ≈ 8V |
| 100 | ≈ 10.0V |
| 250 | ≈ 14.5V |
| 500 | ≈ 17.0V |

| SPEED | VOLT |
|---|---|
| 250mm/S | ≈0.7V |
| 500mm/S | ≈1.3V |

## Chart Driver

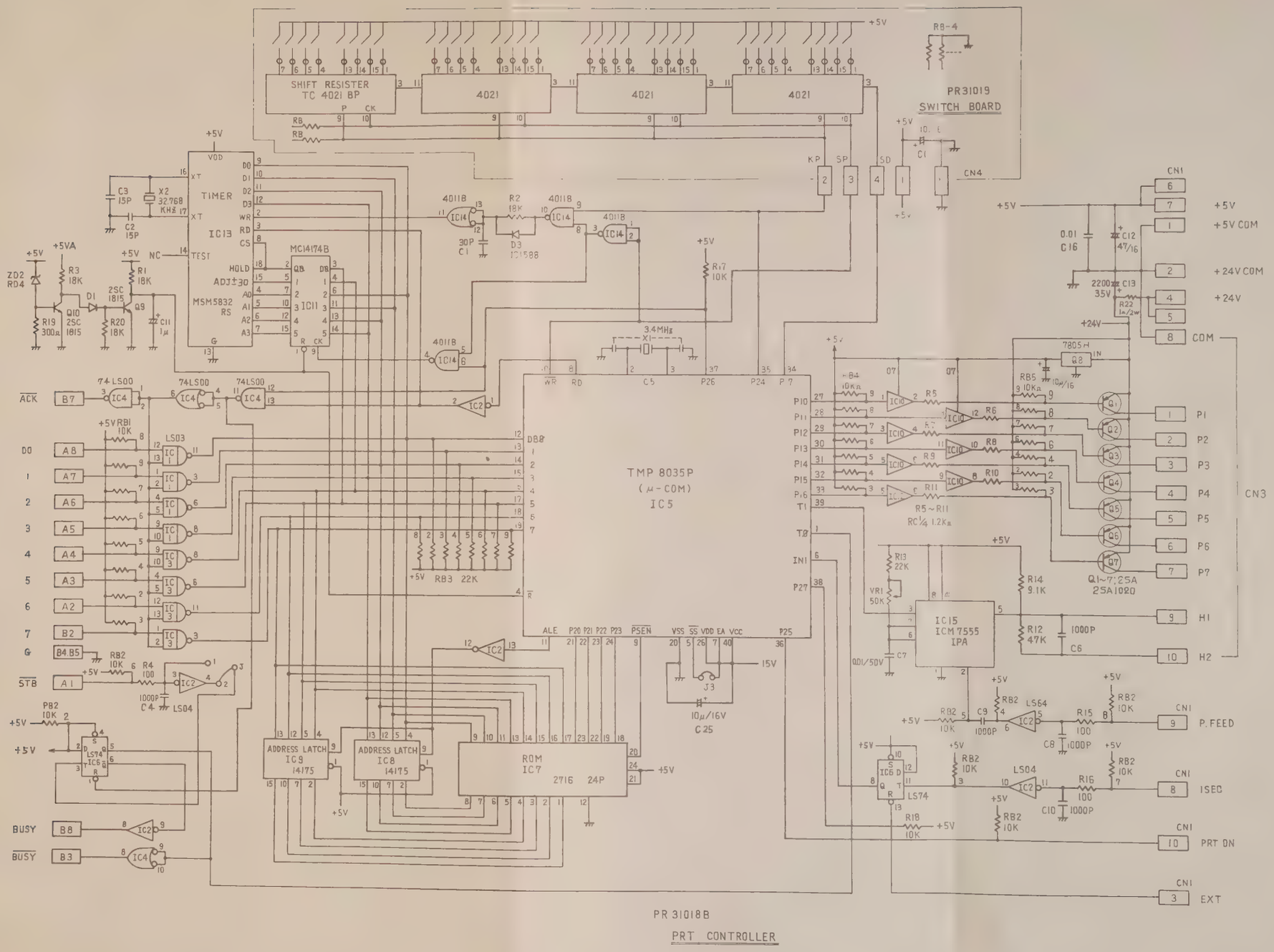
| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| IC1 | G503300054 | IC, Op Amp | NJM4558D | |
| IC2 | A503300121 | IC, Comparator | μPC339C | |
| IC3 | A503300122 | IC, F/V Convertor | MB4206 | |
| IC4 | A503300123 | IC, Op Amp | μPC157C | |
| IC5 | G503300030 | IC, Trimmer | NE555 | |
| IC6, 7 | G503300054 | IC, Op Amp | NJM4558D | |
| IC8 | A503300063 | IC, CMOS MONO. MULTI | TC4528BP | |
| IC9 | A503300098 | IC, Transister Array | μPA2004C | |
| IC10 | A503300094 | IC, CMOS Inverting Buffer | TC4049BP | |
| IC11 | A503300124 | IC, CMOS 2 In-Nor | TC4001BP | |
| IC12 | A503300125 | IC, TTL Inverter | SN74LS04 | |
| IC13 | A503300126 | IC, Voltage Regulator | μA79M08 | |
| IC14 | A503300127 | IC, Voltage Regulator | μA78L082AWC | |
| Q1 | G503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | |
| Q2~4 | A503203017 | T, NPN 70V 100mA 400mW | 2SC980, O | |
| Q5~8 | A503200028 | T, NPN 100V 5A 1.5W | 2SD560, L | |
| Q9, 10 | A503203018 | T, PNP −100V −5A 1.5W | 2SB601, L | |
| Q11 | A503203020 | T, PNP −60V −7A 3W | 2SB675, OL | |
| CR1~5 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 100mA | IS953 | |
| CR6 | G503103004 | Di, Si $V_R$ = 200V $I_F$ = 4A | U06C | |
| CR7~10 | G503100020 | Di, Si $V_R$ = 200V $I_F$ = 1.1A | V06C | |
| CRA1~4 | A503100063 | Di, Si Diode Module | 2E2DM | |
| CRA5 | A503100066 | Di, Si Diode Module | 5EH2M | |
| R1 | G501203738 | R, Solid 1M 1/4 ±5% | RC1/4-1MJ | |
| R2 | G501203719 | R, Solid 2.2K 1/4 ±5% | RC1/4-2.2KJ | |
| R3 | G501203731 | R, Solid 100K 1/4 ±5% | RC1/4-100KJ | |
| R4 | G501203745 | R, Solid 33K 1/4 ±5% | RC1/4-33KJ | |
| R5 | G501203731 | R, Solid 100K 1/4 ±5% | RC1/4-100KJ | |
| R6 | G501203761 | R, Solid 560K 1/4 ±5% | RC1/4-560KJ | |
| R7 | G501303754 | R, Metal Film 1.8K 1/4 ±5% | RNE1/4-1.8KJ | |
| R8 | G501303708 | R, Metal Film 10K 1/4 ±5% | RNE1/4-10KJ | |
| R9 | G501203727 | R, Solid 22K 1/4 ±5% | RC1/4-22KJ | |
| R10 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R11 | G501203773 | R, Solid 910K 1/4 ±5% | RC1/4-910KJ | |
| R12 | G501203709 | R, Solid 220 1/4 ±5% | RC1/4-220J | |
| R13, 14 | G501203730 | R, Solid 56K 1/4 ±5% | RC1/4-56KJ | |
| R15~18 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R19 | G501303709 | R, Metal Film 56K 1/4 ±5% | RNE1/4-56KJ | |
| R20 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R21 | G501203774 | R, Solid 620K 1/4 ±5% | RC1/4-620KJ | |
| R22 | G501203775 | R, Solid 120K 1/4 ±5% | RC1/4-120KJ | |

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R23 | G501303732 | R, Metal Film | 24K | 1/4 | ±5% | RNE1/4-24KJ | |
| R24 | G501303708 | R, Metal Film | 10K | 1/4 | ±5% | RNE1/4-10KJ | |
| R25 | G501303776 | R, Metal Film | 22K | 1/4 | ±5% | RNE1/4-22KJ | |
| R26 | G501303740 | R, Metal Film | 2.4K | 1/4 | ±5% | RNE1/4-2.4KJ | |
| R27 | G501303708 | R, Metal Film | 10K | 1/4 | ±5% | RNE1/4-10KJ | |
| R28 | G501303733 | R, Metal Film | 4.7K | 1/4 | ±5% | RNE1/4-4.7KJ | |
| R29 | G501303774 | R, Metal Film | 3.3K | 1/4 | ±5% | RNE1/4-3.3KJ | |
| R30 | G501303710 | R, Metal Film | 15K | 1/4 | ±5% | RNE1/4-15KJ | |
| R31 | G501303708 | R, Metal Film | 10K | 1/4 | ±5% | RNE1/4-10KJ | |
| R32 | G501303709 | R, Metal Film | 56K | 1/4 | ±5% | RNE1/4-56KJ | |
| R33 | G501303748 | R, Metal Film | 200K | 1/4 | ±5% | RNE1/4-200KJ | |
| R34 | G501203741 | R, Solid | 12K | 1/4 | ±5% | RC1/4-12KJ | |
| R35 | G501203764 | R, Solid | 20K | 1/4 | ±5% | RC1/4-20KJ | |
| R36 | G501303717 | R, Metal Film | 1K | 1/4 | ±5% | RNE1/4-1KJ | |
| R37 | G501303746 | R, Metal Film | 18K | 1/4 | ±5% | RNE1/4-18KJ | |
| R38 | G501303710 | R, Metal Film | 15K | 1/4 | ±5% | RNE1/4-15KJ | |
| R39 | G501303735 | R, Metal Film | 120K | 1/4 | ±5% | RNE1/4-120KJ | |
| R40~42 | G501203722 | R, Solid | 4.7K | 1/4 | ±5% | RC1/4-4.7KJ | |
| R43 | A501609724 | R, Wirewound | 51 | 5 | ±5% | CS5P-51J | |
| R44, 45 | G501203721 | R, Solid | 3.3K | 1/4 | ±5% | RC1/4-3.3KJ | |
| R46, 47 | A501609723 | R, Metal Film | 1 | 3 | ±5% | RSF3B1J | |
| R48, 49 | G501203721 | R, Solid | 3.3K | 1/4 | ±5% | RC1/4-3.3KJ | |
| R50 | A501609724 | R, Wirewound | 51 | 5 | ±5% | CS5P-51J | |
| R51 | G501203731 | R, Solid | 100K | 1/4 | ±5% | RC1/4-100KJ | |
| R52 | G501303717 | R, Metal Film | 1K | 1/4 | ±5% | RNE1/4-1KJ | |
| R53 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R54, 55 | G501203712 | R, Solid | 470 | 1/4 | ±5% | RC1/4-470J | |
| R56 | G501203776 | R, Solid | 8.2K | 1/4 | ±5% | RC1/4-8.2KJ | |
| R57 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R58 | G501203776 | R, Solid | 8.2K | 1/4 | ±5% | RC1/4-8.2KJ | |
| R59, 64 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| R60~63 R65, 66 | G501203724 | R, Solid | 6.8K | 1/4 | ±5% | RC1/4-6.8KJ | |
| R67 | A501605710 | R, Metal Film | 0.22 | 1 | ±5% | RSF18-0.22J | |
| R68~70 | G501203725 | R, Solid | 10K | 1/4 | ±5% | RC1/4-10KJ | |
| VR1 | A504207047 | R, Trimmer, Cermet | 20K | | | TM10KPV-20K | |
| VR2 | A505103029 | R, Trimmer, Cermet | 500K | | | RJ6P-500K | |
| VR3 | B504207038 | R, Trimmer, Cermet | 50K | | | TM10KPV-50K | |
| RA1 | B501002811 | Resister Array | | | ±10% | RKC1/8-B8-22K | |
| RA2 | B501002814 | Resister Array | | | ±10% | RKC1/8-B4-22K | |
| RT1 | G503103012 | Thermister B-Class | 100K | | | 100KD-7 | |

| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| C1, 2 | G502403029 | C, Ceramic | 100P | 50WV | UFD04SA101J-L0B | |
| C3 | G502403034 | C, Ceramic | 33P | 50WV | RAU04SL330KL05AE | |
| C4 | G502303019 | C, Myler Film | 1500P | 50WV | MFL-05D15 | |
| C5, 6 | G502303004 | C, Myler Film | 0.01μ | 50WV | MFL-05SI | |
| C7 | A502203024 | C, Tantalum | 1.5μ | 16WV | CS15EICIR5M | |
| C8 | A502403029 | C, Ceramic | 100P | 50WV | UFD04SA101J-L0B | |
| C9 | G502203003 | C, Tantalum | 3.3μ | 16WV | CS15EIC3R3M | |
| C10 | G502203013 | C, Tantalum | 1μ | 35WV | CS15EIV010M | |
| C11 | G502203017 | C, Tantalum | 22μ | 16WV | CS15EIC220M | |
| C12 | G502203003 | C, Tantalum | 3.3μ | 16WV | CS15EIC3R3M | |
| C13 | G502403007 | C, Ceramic | 0.01μ | 50WV | UFD06-103-L2A | |
| C14 | G502403034 | C, Ceramic | 220P | 50WV | UFD04SA221J-L0B | |
| C15 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C16 | G502103025 | C, Electroric | 47μ | 10WV | SM10VB-47 | |
| C17, 18 | G502403035 | C, Ceramic | 220P | 50WV | UFD04SA221J-L0B | |
| C19, 20 | G502403036 | C, Ceramic | 680P | 50WV | UFD04SA681J-L0B | |
| C21 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C22 | G502103024 | C, Electric | 47μ | 16WV | SM16VB-47 | |
| C23~25 | G502403007 | C, Ceramic | 0.01μ | 50WV | ULD06-103-L2A | |
| C26 | G502103024 | C, Electoric | 47μ | 16WV | SM16VB-47 | |
| C27, 28 | G502203002 | C, Tantalum | 10μ | 16WV | CS15EIC100M | |
| C29 | A502103026 | C, Electoric | 100μ | 6.3WV | SM6.3VB100 | |
| FTE | A502403037 | C, Electoric | 1000μ | 50WV | FTE1G102 | |
| SW12, 13 | A508201006 | Switch Push Lock | | | KSD1-2-0LLDC | |
| SW14 | A508201010 | Switch Push Non-Lock | | | KSD1-2-0NLDC | |
| SW15 | A508201006 | Switch Push Lock | | | KSD1-2-0LLDC | |
| SW16 | A508101015 | Switch Rotary | | | DSR2-6 | |
| F1 | A512300010 | Fuse | 2A | | 275002 | |
| F2 | A512300025 | Fuse | 4A | | 275004 | |
| F3 | A512300010 | Fuse | 2A | | 275002 | |
| F4 | A512300025 | Fuse | 4A | | 275004 | |
| TP1~3 | B513400027 | Check Pin | | | LC-1-G | |
| LED1 | B512100018 | Di, LED RED | $I_F$ = 30mA | | SLB26 UR | |
| P4 | B513400046 | Connector | 6 PIN | | HNC2-2.5P-6DSL | |
| P3 | A513301007 | Connector | 30 PIN | | PS30PAD4T1A1 | |
| J5 | A513100344 | Connector | 14 PIN | | 57-40140D39 | |
| J6 | A513300604 | Connector | 10P x 2 | | 225J21021-487 | |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| PCB | A511310130 | Printed Circuit Board | 3101-13B | |
| | B516100020 | Cap, Black | B911 | x 4 |
| | B508201007 | Spacer | 1P-10 | x 4 |
| | B516100016 | Knob, $\phi$10mm, Black | 021-222 | For SW16 |
| | B516100018 | Cap, $\phi$10mm, Black | 040-162 | For SW16 |

## Printer Unit

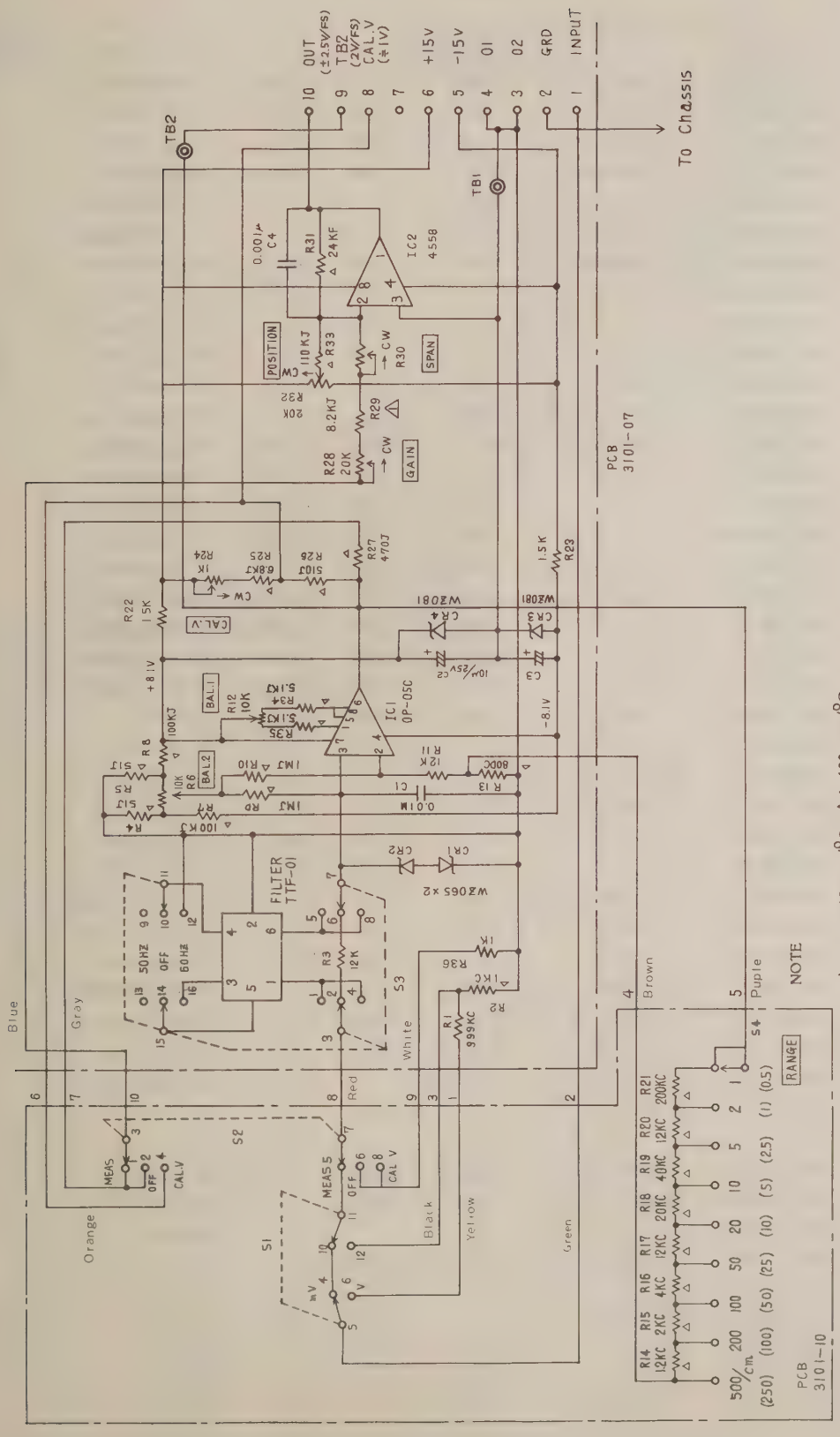


## Printer Unit

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| IC1 | A503300135 | IC, TTL Quad 2 In-Nand O.C. | SN74LS03 | |
| IC2 | A503300125 | IC, TTL Hex Inverter | SN74LS04 | |
| IC3 | A503300135 | IC, TTL Quad 2 In-Nand O.C. | SN74LS03 | |
| IC4 | A503300138 | IC, TTL Quad 2 In-Nand | SN74LS00 | |
| IC5 | A503300132 | IC, NMOS Micro Computer | TMP8035P | |
| IC6 | A503300137 | IC, TTL Dual D-F.F. | SN74LS74 | |
| IC7 | A503300133 | IC, NMOS EP ROM | MB8516 | |
| IC8, 9 | A503300140 | IC, CMOS Quad D Flip Flop | TC40174BP | |
| IC10 | A503300136 | IC, TTL Hex Buffer O.C. | SN7407 | |
| IC11 | A503300140 | IC, CMOS HEX D Flip Flop | TC40174BP | |
| IC12 | A503300136 | IC, TTL Hex Buffer O.C. | SN7407 | |
| IC13 | A503300134 | IC, CMOS Real Time Clock | MSM5832RS | |
| IC14 | A503300062 | IC, CMOS Quad 2 In-Nand | TC4011BP | |
| IC15 | A503300142 | IC, CMOS Timer | ICM7555 | |
| Q8 | A503300128 | IC, Voltage Regulator | μPC7805H | |
| Q1~7 | A503203019 | T, PNP –50V –2A 900mW | 2SA1020, Y | |
| Q9, 10 | G503203014 | T, NPN 30V 100mA 200mW | 2SC1815, Y | 2SC373 |
| R1~3 | G501203758 | R, Solid 18K 1/4 ±5% | RC1/4-18KJ | |
| R4 | G501203707 | R, Solid 100 1/4 ±5% | RC1/4-100J | |
| R5~11 | G501203717 | R, Solid 1.2K 1/4 ±5% | RC1/4-1.2KJ | |
| R12 | G501203751 | R, Solid 47K 1/4 ±5% | RC1/4-47KJ | |
| R13 | G501203727 | R, Solid 22K 1/4 ±5% | RC1/4-22KJ | |
| R14 | G501203781 | R, Solid 9.1K 1/4 ±5% | RC1/4-9.1KJ | |
| R15, 16 | G501203707 | R, Solid 100 1/4 ±5% | RC1/4-100J | |
| R17, 18 | G501203725 | R, Solid 10K 1/4 ±5% | RC1/4-10KJ | |
| R19 | G501203779 | R, Solid 300 1/4 ±5% | RC1/4-300J | |
| R20 | G501203758 | R, Solid 18K 1/4 ±5% | RC1/4-18KJ | |
| R22 | G501606706 | R, Metal Film 1 2 ±5% | RFS2B-1J | |
| RB1, 2 | B501002813 | Resister Arrey 10K x 8 ±10% | RM8-103J | |
| RB3 | B501002811 | Resister Arrey 22K x 8 ±10% | RM8-223J | |
| RB4, 5 | B501002813 | Resister Arrey 10K x 8 ±10% | RM8-103J | |
| D1 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 0.1A | IS953 | |
| ZD2 | A503100068 | Di, Zener 4.0V 0.5W ±5% | RD4A | |
| D3 | G503100020 | Di, Si $V_R$ = 30V $I_F$ = 0.1A | IS953 | |
| VR1 | A505103027 | R, Trimmer Cermet 50K | RJ6P-50K | |
| C1 | G502403034 | C, Ceramic 33P 50WV | RAU04SL330L05AE | |
| C2, 3 | A502703007 | C, Mica 15P 100WV | Z05-100V15P | |
| C4 | G502403015 | C, Ceramic 1000P 50WV | ULD06-102 | |
| C5 | | | | |
| C6 | G502403015 | C, Ceramic 1000P 50WV | ULD06-102 | |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| C7 | G502303004 | C, Myler Film 0.01 50WV | MFL-0.5SI | |
| C8 | G502403015 | C, Ceramic 1000P 50WV | ULD06-102 | |
| C9 | G502303002 | C, Myler Film 1000P 50WV | MFL-0.5DI | |
| C10 | G502403015 | C, Ceramic 1000P 50WV | ULD06-102 | |
| C11 | G502203013 | C, Tantalum 1μ 35WV | CS15EIV010M | |
| C12 | A502101023 | C, Electrolytic 47μ 16WV | SL16VB-47 | |
| C13 | A502101024 | C, Electrolytic 1000μ 35WV | SL35T-1000CI | |
| C14 | G502203002 | C, Tantalum 10μ 15WV | CS15EIC100M | |
| C15~24 | G502403007 | C, Ceramic 0.01μ 50WV | ULD06-103-L2A | |
| X1 | B502802004 | Ceramic Osillator - 3.40MHz | CSA-3.40MHz | Pair |
| X2 | B502802006 | Crystal Osillator 32.768KHz | | |
| CN4 | A513400072 | Connector, Receptacle 10P | HNC2-2.5S-10 | |
| CN5 | A513400050 | Connector, 16 PIN-Plug | FCN-365P016-AG | |
| | A513400052 | Plate, Connector Holder and Cover | FCN 360A2 and FCN-260C016B | |
| | A513400051 | Connector, 16 PIN-Jack | FCN-261J016-AG | |
| | B513400054 | Connector, Pin Header 5P | HNC2-2.5P-5DSL | |
| | B513400044 | Connector, Receptacle 5P | HNC2-2.5S-5 | |
| | B513400037 | Contact Pin | HNC-2.5S-A | x 5 |
| PCB | A511310080 | Printed Circuit Board | 3101-08B | |
| | A513400056 | IC-Socket 18 PIN | DILB-P-8J, 18P | |
| | A513400055 | IC-Socket 24 PIN | DILB-P-8J, 24P | |
| C25 | G502203002 | C, Tantalum 10μ 15WV | CS15EIC100M | |
| SW1~8 | A508401012 | SW. Thumb Wheel, Decimal | A7MA-206-P2 | |
| | A508401015 | SW. Spacer | A7M-2PA | |
| | A508401013 | SW. Hook | A7M-2M | |
| IC1~4 | A503300131 | IC, CMOS Shift Registor | TC4021BP | |
| RB1~8 | G501102745 | Resistor Array | RKC1/8-B4-22KK | |
| C1 | G502203002 | C, Tantalum 10μ 15WV | CS15EIC100M | |
| C2 | G502403007 | C, Ceramic 0.01μ 50WV | ULD06-103-L2A | |
| PCB | A511310090 | Printed Circuit Board | 3101-09 | |
| | A597110001 | Print Head 24V 1A | EUX-TP703AT | |
| | A513300612 | Connector 10P x 2 | 225J21021-488 | |

## Pre Amplifier Type H (AH3101), DH (AH3102)




NOTE

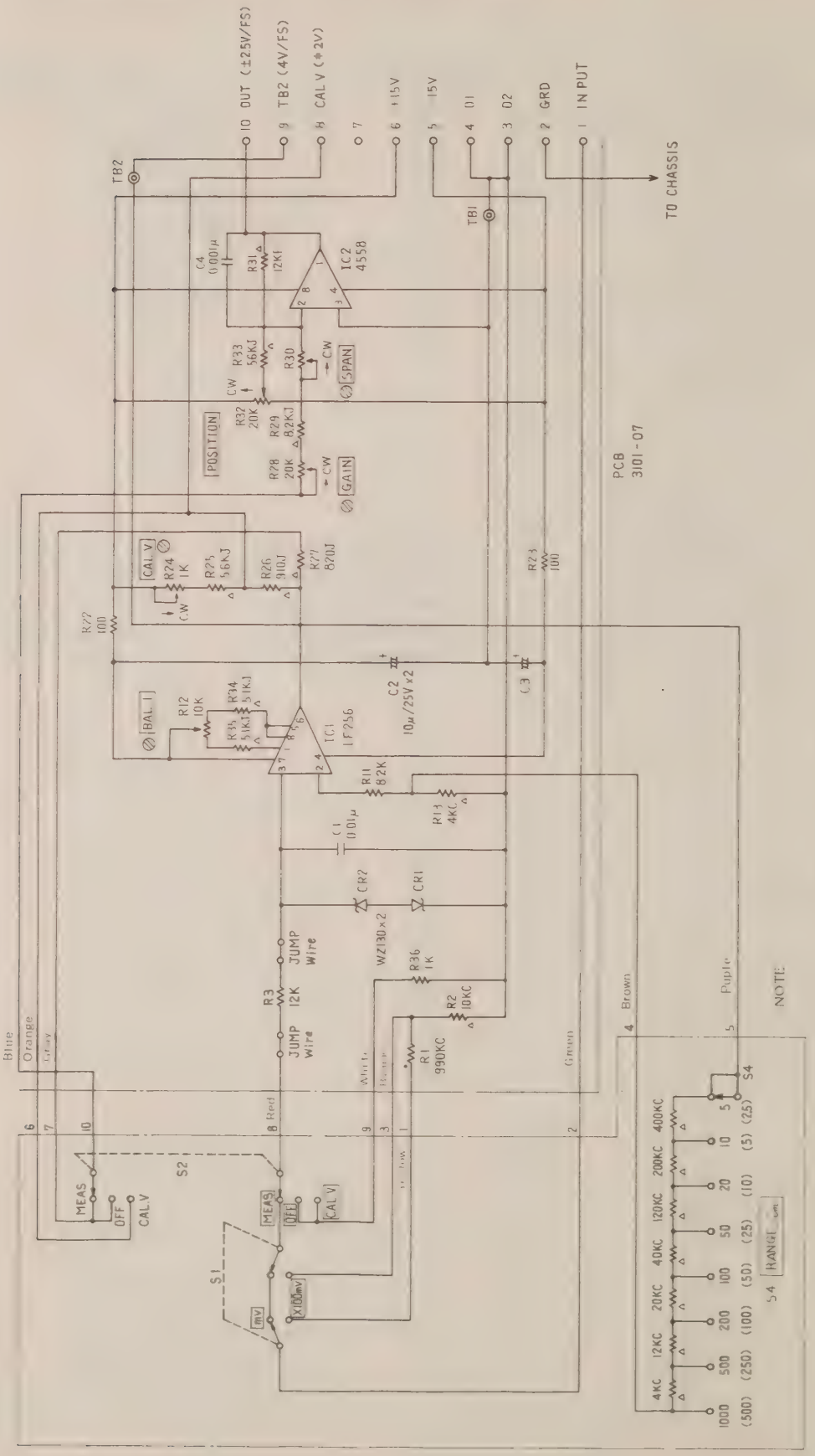
1) • is 25 ppm/°C. △ is 100 ppm/°C.
2) Trimmer R30 used only in export models.
   It is short-circuited in the standard models.
3) Ranges for model AH3102 shown within brackets.

## Pre Amplifier Type H (AH3101), DH (AH3102)

| Figure | Part No. | Description | | | | Type | Remarks |
|---|---|---|---|---|---|---|---|
| R1 | G501503302 | R, Metal Film | 999K | 1/2W | ±0.25% | RN65E999KC | |
| R2 | G501303301 | R, " | 1K | 1/4W | ±0.25% | RNE1/4-1KC | |
| R3 | G501203741 | R, Solid | 12K | 1/4W | ±5% | RC1/4-12KJ | |
| R4 | G501303753 | R, Metal Film | 51 | 1/4W | ±5% | RNE1/4-51J | |
| R5 | G501303753 | R, " | " | " | " | RNE1/4-51J | |
| R6 | G504207021 | R, Trimme Cermet | 10K | | | TM10KPH-10K | |
| R7 | G501303771 | R, Metal Film | 100K | 1/4W | ±5% | RNE1/4-100KJ | |
| R8 | G501303771 | R, " | " | " | " | RNE1/4-100KJ | |
| R9 | 501304704 | R, " | 1M | 1/2W | ±5% | RNE1/2-1MJ | |
| R10 | 501304704 | R, " | " | " | " | RNE1/2-1MJ | |
| R11 | G501203741 | R, Solid | 12K | 1/4W | ±5% | RC1/4-12KJ | |
| R12 | 504207048 | R, Trimmer Cermet | 10K | | | TM10KPH-10K | |
| R13 | 501303315 | R, Metal Film | 800 | 1/4W | ±0.25% | RNE1/4-800C | |
| R14 | 501303316 | R, " | 1.2K | 1/4W | ±0.25% | RNE1/4-1.2KC | |
| R15 | 501303317 | R, " | 2K | 1/4W | ±0.25% | RNE1/4-2KC | |
| R16 | 501303308 | R, " | 4K | 1/4W | ±0.25% | RNE1/4-4KC | |
| R17 | 501303309 | R, " | 12K | 1/4W | ±0.25% | RNE1/4-12KC | |
| R18 | 501303310 | R, " | 20K | 1/4W | ±0.25% | RNE1/4-20KC | |
| R19 | 501303311 | R, " | 40K | 1/4W | ±0.25% | RNE1/4-40KC | |
| R20 | 501303312 | R, " | 120K | 1/4W | ±0.25% | RNE1/4-120KC | |
| R21 | 501303313 | R, " | 200K | 1/4W | ±0.25% | RNE1/4-200KC | |
| R22 | G501203718 | R, Solid | 1.5K | 1/4W | ±5% | RC1/4-1.5KJ | |
| R23 | G501203718 | R, " | " | " | " | RC1/4-1.5KJ | |
| R24 | 504207049 | R, Trimmer Cermet | 1K | | | TM10KPH-1K | |
| R25 | G501303713 | R, Metal Film | 6.8K | 1/4W | ±5% | RNE1/4-6.8KJ | |
| R26 | G501303731 | R, " | 510 | 1/4W | ±5% | RNE1/4-510J | |
| R27 | G501303704 | R, " | 470 | 1/4W | ±5% | RNE1/4-470J | |
| R28 | 504103015 | R, Variable Carbon | 20K | | | RV16YP20SB20K | |
| R29 | G501303703 | R, Metal Film | 8.2K | 1/4W | ±5% | RNE1/4-8.2KJ | |
| R31 | G501303511 | R, " | 24K | 1/4W | ±1% | RNE1/4-24KF | |
| R32 | 504103015 | R, Variable Carbon | 20K | | | RV16YP20SB20K | |
| R33 | B501303767 | R, Metal Film | 110K | 1/4W | ±5% | RNE1/4-110KJ | |
| R34 | G501303758 | R, " | 5.1K | 1/4W | ±5% | RNE1/4-5.1K | |
| R35 | G501303758 | R, " | 5.1K | " | " | RNE1/4-5.1K | |
| R36 | G501203716 | R, Solid | 1K | 1/4W | ±5% | RC1/4-1KJ | |
| C1 | G502303004 | C, Myler Film | 0.01μ | 50WV | | MFL-05SI | |
| C2 | 502103023 | C, Electrolytic | 10μ | 25WV | | SM25VB-10 | |
| C3 | 502103023 | C, " | " | " | | AM25VB-10 | |
| C4 | G502303002 | C, Myler Film | 0.001μ | 50WV | | MFL-05DI | |
| CR1 | G503100035 | Di, Zener | 6.5V | 0.5W | ±5% | WZ065 | |
| CR2 | G503100035 | Di, " | " | " | " | WZ065 | |
| CR3 | G503100007 | Di, " | 8.1V | " | " | WZ081 | |
| FILT | A518110005 | Twin T Filter | | | | TTF-01 | |

| Figure | Part No. | Description | | Type | Remarks |
|---|---|---|---|---|---|
| IC1 | A503300006 | IC, Op-Amp | | OP-05C | |
| IC2 | A503300054 | IC, " | Dual | NJM4558D | |
| S1 | 508304008 | Switch, Slide | | SSA042L12 | |
| S2 | G508304002 | " | | SSA043L12 | |
| S3 | G508304003 | " | | SSA043L06 | |
| S4 | 507101108 | Switch, Rotary | 1-1-9 | SRM1019-15R-P | |
| TB1 | B513400027 | Test Terminal | | LC-1-G | |
| TB2 | B513400027 | " | | LC-1-G | |
| PCB | 511310070 | Printed Circuit Board | | 3101-07 | |
| PCB | 511310100 | " | | 3101-10 | |
| | 067117110 | Spacer | | | Position |
| | 516100016 | Knob | ϕ10mm, Black, with Line | 021-222 | Position |
| | 516100028 | " | ϕ14.5mm, Black, with Line | 023-342 | Range |
| | 516100018 | Cap | ϕ10mm, Black, with Line | 040-162 | Position |
| | 516100029 | " | ϕ14.5mm, Black, with Line | 040-362 | Range |
| | 516100030 | Nut Cover | ϕ14.5mm, Black, with Line | 044-322 | |

## Pre Amplifier Type L (AL3101), DL (AL3102)

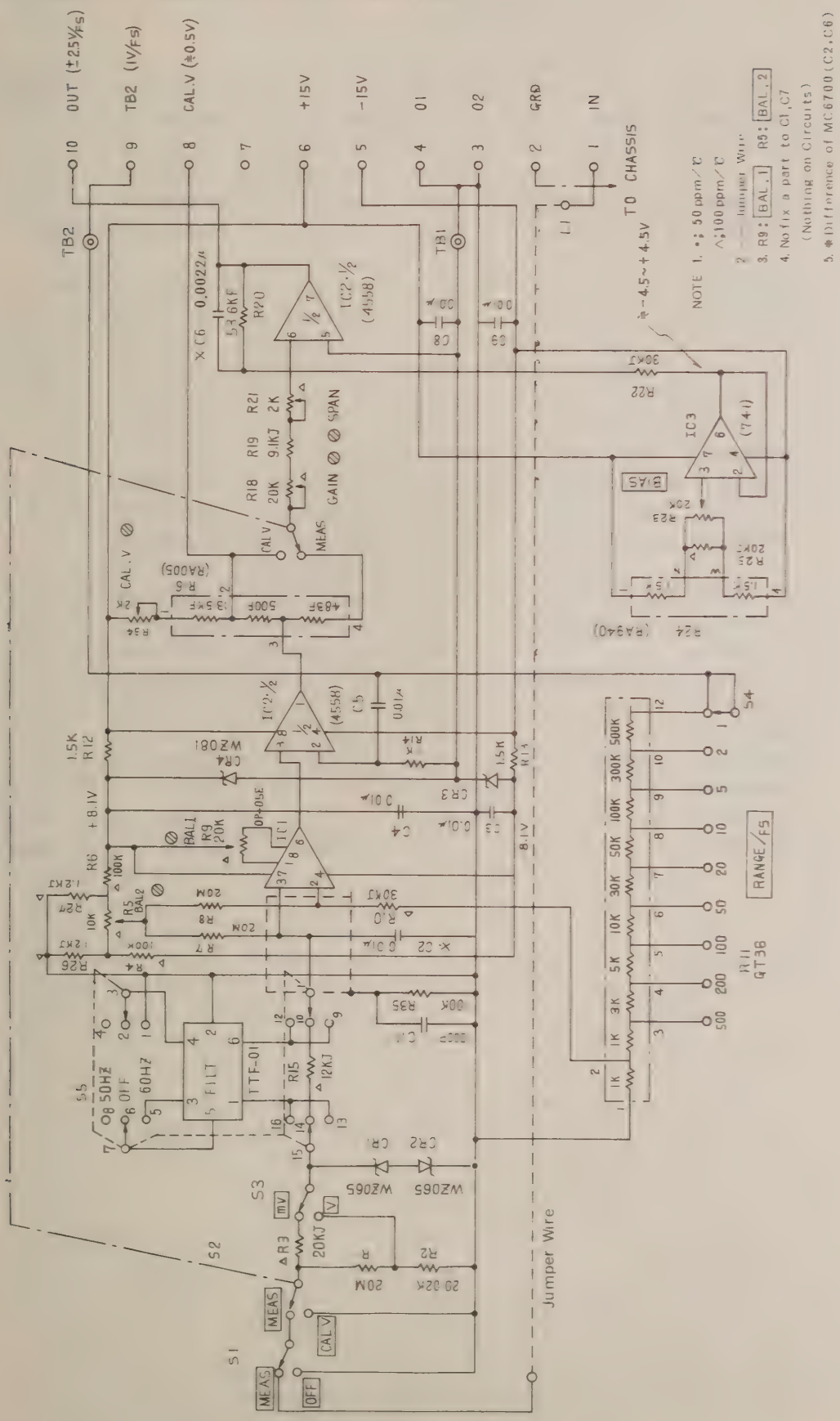


## Pre Amplifier Type L (AL3101), DL (AL3102)

| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| R1 | G501503301 | R, Metal Film | 990K | 1/2W ±0.25% | RN65E990KC | |
| R2 | 501303307 | R, " | 10K | 1/4W ±0.25% | RNE1/4-10KC | |
| R3 | G501203741 | R, Solid | 12K | 1/4W ±5% | RC1/4-12KJ | |
| R11 | 501203776 | R, " | 8.2K | 1/4W ±5% | RC1/4-8.2KJ | |
| R12 | G504207021 | R, Trimmer Cermet | 10K | | TM10KPH-10K | |
| R13 | 501303308 | R, Metal Film | 4K | 1/4W ±0.25% | RNE1/4-4KC | |
| R14 | 501303308 | R, " | " | " " | RNE1/4-4KC | |
| R15 | 501303309 | R, " | 12K | 1/4W ±0.25% | RNE1/4-12KC | |
| R16 | 501303310 | R, " | 20K | 1/4W ±0.25% | RNE1/4-20KC | |
| R17 | 501303311 | R, " | 40K | 1/4W ±0.25% | RNE1/4-40KC | |
| R18 | 501303312 | R, " | 120K | 1/4W ±0.25% | RNE1/4-120KC | |
| R19 | 501303313 | R, " | 200K | 1/4W ±0.25% | RNE1/4-200KC | |
| R20 | 501303314 | R, " | 400K | 1/4W ±0.25% | RNE1/4-400KC | |
| R22 | G501203707 | R, Solid Film | 100 | 1/4W ±5% | RC1/4-100 J | |
| R23 | G501203707 | R, Solid Film | " | " " | RC1/4-100 J | |
| R24 | 504207049 | R, Trimmer Cermet | 1K | | TM10KPH-1K | |
| R25 | G501303723 | R, Metal Film | 5.6K | 1/4W ±5% | RNE1/4-5.6KJ | |
| R26 | 501303795 | R, " | 910K | 1/4W ±5% | RNE1/4-910J | |
| R27 | G501303728 | R, " | 820K | 1/4W ±5% | RNE1/4-820J | |
| R28 | 504103015 | R, Variable Carbon | 20K | | RV16YP20SB20K | |
| R29 | 501303703 | R, Metal Film | 8.2K | 1/4W ±5% | RNE1/4-8.2KJ | |
| R31 | 501303567 | R, " | 12K | 1/4W ±1% | RNE1/4-12KF | |
| R32 | 504103015 | R, Variable Carbon | 20K | | RV16YP20SB20K | |
| R33 | G501303709 | R, Metal Film | 56K | 1/4W ±5% | RNE1/4-56KJ | |
| R34 | G501303758 | R, " | 5.1K | 1/4W ±5% | RNE1/4-5.1KJ | |
| R35 | G501303758 | R, " | 5.1K | 1/4W ±5% | RNE1/4-5.1KJ | |
| R36 | G501203716 | R, Solid Film | 1K | 1/4W ±5% | RC1/4-1KJ | |
| C1 | G502303004 | C, Myler Film | 0.01μ | 50WV | MFL-05SI | |
| C2 | 502103023 | C, Electrolytic | 10μ | 25WV | SM25VB-10 | |
| C3 | 502103023 | C, " | " | " | SM25VB-10 | |
| C4 | G502303002 | C, Myler Film | 0.001μ | 50WV | MFL-05DI | |
| CR1 | G503100005 | Di, Zener | 13V | 0.5W ±5% | WZ130 | |
| CR2 | G503100005 | Di, " | " | " " | WZ130 | |
| IC1 | 503300130 | IC, Op-Amp | FET-Top | | LF256 | |
| IC2 | A503300054 | IC, " | Dual | | NJM4558D | |
| S1 | 508304008 | Switch, Slide | | | SSA042L12 | |
| S2 | G508304002 | " | | | SSA043L12 | |
| S4 | | Switch, Rotary | 1-1-8 | | M1018-15R-P | |

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| TB1 | B513400027 | Test Terminal | LC-1-G | |
| TB2 | B513400027 | " | LC-1-G | |
| PCB | 511310070 | Printed Circuit Board | 3101-07 | |
| PCB | 511310100 | " | 3101-10 | |
| | 067117110 | Spacer | | Position |
| | 516100016 | Knob, ϕ10mm, Black, with Line | 021-222 | Position |
| | 516100028 | " ϕ14.5mm, Black, with Line | 023-342 | Range |
| | 516100018 | Cap, ϕ10mm, Black, with Line | 040-162 | Position |
| | 516100029 | " ϕ14.5mm, Black, with Line | 044-362 | Range |
| | 516100030 | Nut Cover, ϕ14.5mm, Black, with Line | 044-322 | Range |

## Pre Amplifier Type Z (AZ3101), DZ (AZ3102)



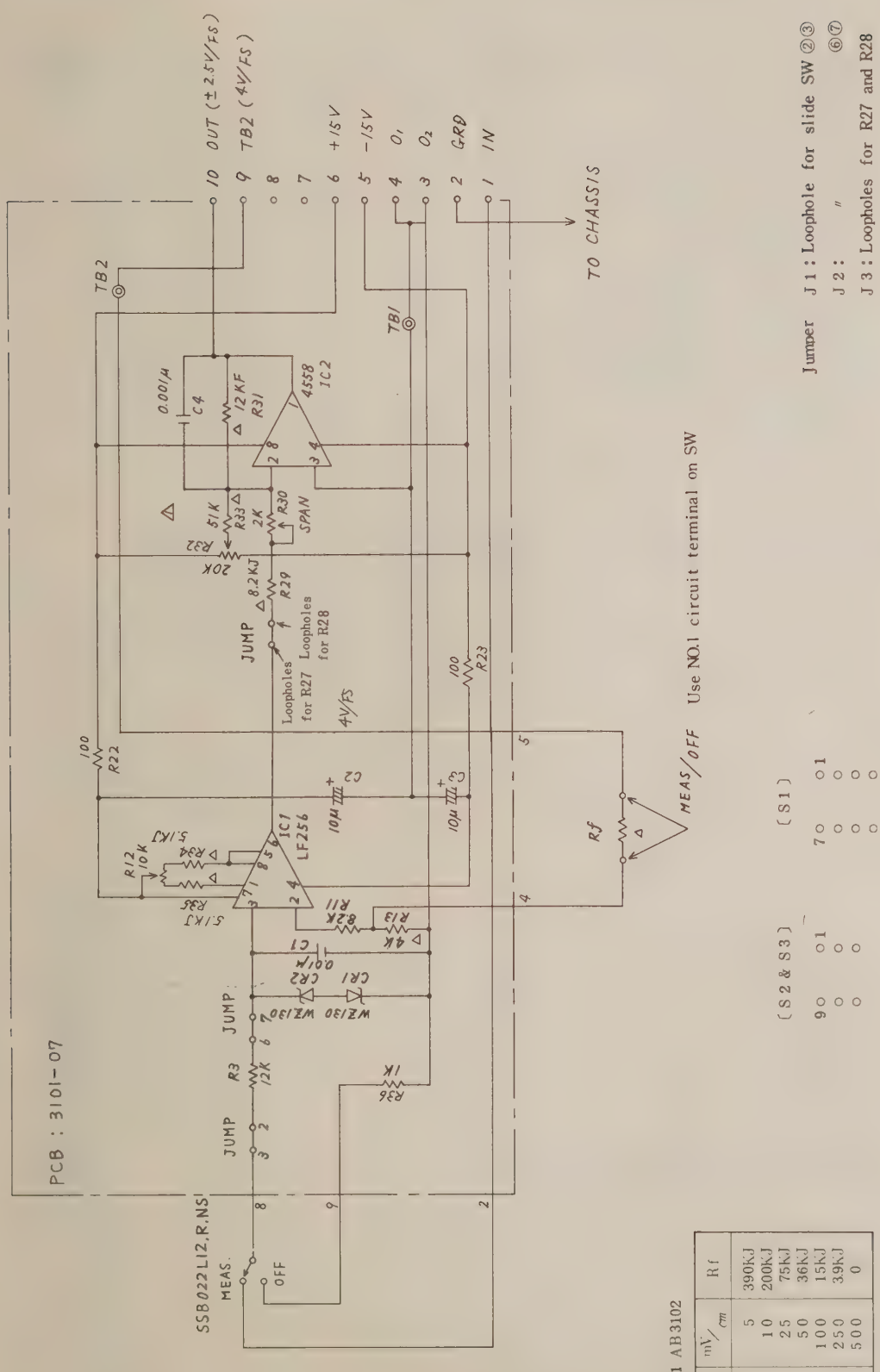
## Pre Amplifier Type Z (AZ3101), DZ (AZ3102)

| Figure | Part No. | Description | Type | Remarks |
|---|---|---|---|---|
| CR3 | 503100050 | Di, Zener 9V 0.4W ±5% 20ppm/°C | IN937A | |
| IC1 | 503300007 | IC, Op-Amp | OP05E | |
| IC2 | 503300054 | IC, Op-Amp Dual | NJM4558D μPC4558C μPC258C | |
| IC3 | 503300025 | IC, Op-Amp | NJM741D μPC741C μPC151C | |
| FILT | 518110005 | Filter, Twin T 50/60Hz –40dB | TTF-01 | |
| S1 | 508302006 | Switch, Slide, Non-shorting | 1101AV2BE-2 | |
| S2 | 508201008 | Switch, Push, Snap-Action-Momentary | 8225AV2B | |
| S3 | 508302006 | Switch, Slide, Non-Shorting | 1101AV2BE-2 | |
| S4 | 507111101 | Switch, Rotary | 11X30B12JW (3388) | |
| S5 | 508304003 | Switch, Slide | SSA043L06 | |
| TB1 | 513400027 | Test Terminal | LC-1-G | 〃 |
| TB2 | 513400027 | Test Terminal | LC-1-G | |
| PCB | 511661002 | Printed Circuit Board | PA-HLZ | |
| | 067117110 | Spacer | | |
| | B516100016 | Knob φ10mm, Black, with Line | 021-222 | Range |
| | B516100019 | 〃 φ10mm, Black | 020-212 | Position |
| | B516100017 | Cap φ10mm, Black | 040-102 | Position |
| | B516100018 | 〃 φ10mm, Black, with Line | 040-162 | Range |

| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| R1 | 501503303 | R, Metal Glaze 20M | 1W | ±0.1% | RH1HVC20MC/RN | |
| R2 | 501503605 | R, Metal Glaze 20.02K | 1/4W | ±0.1% | RN1/4-20.02KA | |
| R3 | 501303770 | R, Metal Glaze 20K | 1/4W | ±5% | RNE1/4-20KJ | |
| R4 | 501303771 | R, Metal Glaze 100K | 1/4W | ±5% | RNE1/4-100KJ | |
| R5 | 505103016 | R, Trimmer Sermet 10K | | | RJ6X-10K | |
| | | | | | RJC06X-10K | |
| | | | | | RT5MX-10K | |
| R6 | 501303771 | R, Metal Film 100K | 1/4W | ±5% | RNE1/4-100KJ | |
| R7 | 501502216 | R, Metal Glaze 20M | 1/8W | ±10% | RH1/8HVS20MK | |
| R8 | 501502216 | R, Metal Glaze 20M | 1/8W | ±10% | RH1/8HVS20MK | |
| R9 | 505101014 | R, Trimmer Sermet 20K | | | RJ20P-20K | |
| | | | | | 89PR20K | |
| | | Multi-Turn | | | RTF34MP-20K | |
| R10 | B501303718 | R, Metal Film 30K | 1/4W | ±5% | RNE1/4-30KJ | |
| R11 | 501003307 | Resistor Array | | ±10% | GT36 | |
| R14 | B501203716 | Resistor Array 1K | 1/4W | ±10% | RC1/4-1KJ | |
| R15 | B501303707 | R, Metal Film 12K | 1/4W | ±5% | RNE1/4-12KJ | |
| R16 | A501002809 | Resistor Array | | ±0.25% | RA005 | |
| R17 | 501433303 | R, Metal Film 483.3 | 1/4W | ±0.25% | RP42A483.3C | |
| R18 | 504105006 | R, Variable Sermet 20K | | | GFP161-20SB 20K | |
| R19 | 501443716 | R, Metal Film 9.1K | 1/4W | ±5% | RP42C9.1KJ | |
| R20 | 501443514 | R, Metal Film 53.6K | 1/4W | ±1% | RP42C53.6KF | |
| R21 | 504103017 | R, Trimmer Sermet 2K | | | RJ6X-2K RJC06X-2K | |
| R12 | G501203718 | R, Solid 1.5K | 1/4W | ±10% | RC1/4-1.5KJ | |
| | | | | | RT5MX-2K | |
| R13 | G501203718 | R, Solid 1.5K | 1/4W | ±10% | RC1/4-1.5KJ | |
| R22 | 501443515 | R, Metal Film 12K | 1/4W | ±1% | RP42C12KF | |
| R23 | 504105007 | Potentiometer, Wirewound 20K | | | M1305-20K | |
| | | Multi-turn | | | | |
| R24 | 501003309 | Resistor Array | | ±0.1% | RA940 | |
| R26 | 501303756 | R, Metal Film 1.2K | 1/4W | ±5% | RNE1/4-1.2KJ | |
| R27 | 501303756 | R, Metal Film 1.2K | 1/4W | ±5% | RNE1/4-1.2KJ | |
| R34 | G505103009 | R, Trimmer Sermet 2K | | | RJ6X-2K | RJC06X-2K |
| R35 | G501203731 | R, Solid 100K | 1/4W | | RC1/4-100KJ | |
| C2 | G502303004 | C, Myler Film 0.01μ | 50WV | | MFL-05SI | |
| C5 | G502303004 | C, Myler Film 0.01μ | 50WV | | MFL-05SI | |
| C6 | G502303001 | C, Myler Film 0.0022μ | 50WV | | MFL-05D22 | |
| CR3 | G503100007 | Di, Zener 8.1V | 0.5W | | WZ-081 | |
| CR4 | G503100007 | Di, Zener 8.1V | 0.5W | | WZ-081 | |
| CR1 | B503100005 | Di, Zener 6.5V | 0.5W | ±5% | WZ-065 | |
| CR2 | B503100005 | Di, Zener 6.5V | 0.5W | ±5% | WZ-065 | |

| Figure | Part No. | Description | | | Type | Remarks |
|---|---|---|---|---|---|---|
| C3 | G502303004 | C, Myler Film | 0.01M | 50WV | MFL-05SI | |
| C4 | " | C, Myler Film | " | " | " | |
| C8 | " | C, Myler Film | " | " | " | |
| C9 | " | C, Myler Film | " | " | " | |
| C11 | G502303002 | C, Myler Film | 0.001$\mu$ | 50WV | MFL-05D1 | |

## Pre-Amplifier Type AB3101, AB3102




Jumper J1 : Loophole for slide SW ②③
J2 : 〃 ⑥⑦
J3 : Loopholes for R27 and R28

(S2 & S3)

| | |
|---|---|
| 9 | 1 |
| | |
| | |
| | |
| | |
| | |
| 16 | 8 |

(S1)

| | |
|---|---|
| 7 | 1 |
| | |
| | |
| | |
| | |
| 12 | 6 |

Bottom View

AB3101 AB3102

| mV/cm | mV/cm | Rf |
|---|---|---|
| 10 | 5 | 390KJ |
| 20 | 10 | 200KJ |
| 50 | 25 | 75KJ |
| 100 | 50 | 36KJ |
| 200 | 100 | 15KJ |
| 500 | 250 | 3.9KJ |
| 1000 | 500 | 0 |

## Pre-Amplifier Type AB3101, AB3102

| Figure | Part No. | Description | | | | Type | Remarks | |
|---|---|---|---|---|---|---|---|---|
| R3 | G501203741 | R, Solid | 12K | 1/4W | ±5% | RC1/4-12KJ | | |
| R11 | G501203776 | R, " | 8.2K | 1/4W | ±5% | RC1/4-8.2KJ | | |
| R12 | G504207021 | R, Trimmer Cermet | 10K | | | TM10KPH-10K | | |
| R13 | A501303308 | R, Metal Film | 4K | 1/4W | ±0.25% | RNE1/4-4KC | | |
| R22 | G501203707 | R, Solid | 100 | 1/4W | ±5% | RC1/4-100 J | | |
| R23 | G501203707 | R, " | " | " | " | RC1/4-100 J | | |
| R29 | G501303703 | R, Metal Film | 8.2K | 1/4W | ±5% | RNE1/4-8.2KJ | | |
| R30 | G504207022 | R, Trimmer Cermet | 2K | | | TM10KPH-2K | | |
| R31 | G501303567 | R, Metal Film | 12K | 1/4W | ±1% | RNE1/4-12KF | | |
| R32 | A504103015 | R, Variable Carbon | 20K | | | RV16YP20SB20K | | |
| R33 | G501810451 | R, Metal Film | 51K | 1/4W | ±1% | RN1/4-51KF | | |
| R34 | G501303758 | R, " | 5.1K | 1/4W | ±5% | RNE1/4-5.1KJ | | |
| R35 | | R, " | " | " | " | " | | |
| R36 | G501203716 | R, Solid | 1K | 1/4W | ±5% | RC1/4-1KJ | | |
| C1 | G502303004 | C, Myler Film | 0.01μ | 50wV | | CF, MFL-05S1 | | |
| C2 | G502103023 | C, Electrolytic | 10μ | 25wV | | CE, SM25VB-10 | | |
| C3 | | C " | " | " | | " | | |
| C4 | G502303002 | C, Myler Film | 0.001μ | 50wV | | MFL-05D1 | | |
| CR1 | G503100005 | Di, Zener | 13V | 0.5W | ±5% | WZ130 | | |
| CR2 | " | Di, " | " | " | " | " | | |
| IC1 | A503300130 | IC, Op-Amp | FET-TOP | | | TDE0156CM | | |
| IC2 | G503300054 | IC, Op-Amp Dual | | | | NJM4558D | | |
| TB1 | B513400027 | Test Terminal | | | | LC-1-G | | |
| TB2 | " | " | | | | LC-1-G | | |
| | | | | | | | AB3101 | AB3102 |
| Rf | G501303796 | Metal Film | 390K | 1/4W | ±5% | RNE1/4-390KJ | 10 mV | 5 mV |
| " | G501303760 | " | 200K | " | " | RNE1/4-200KJ | 20 mV | 10 mV |
| R | G501303757 | " | 75K | " | " | RNE1/4-75KJ | 50 mV | 25 mV |
| | G501303722 | " | 36K | " | " | RNE1/4-36KJ | 100 mV | 50 mV |
| | G501303710 | " | 15K | " | " | RNE1/4-15KJ | 200 mV | 100 mV |
| | G501303729 | " | 3.9K | " | " | RNE1/4-3.9KJ | 500 mV | 250 mV |
| | B516100016 | Knob, ϕ9mm, Black, with Line | | | | 021-222 | Position | |
| | B516100018 | Cap, ϕ9mm, Black, with Line | | | | 040-162 | Position | |

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